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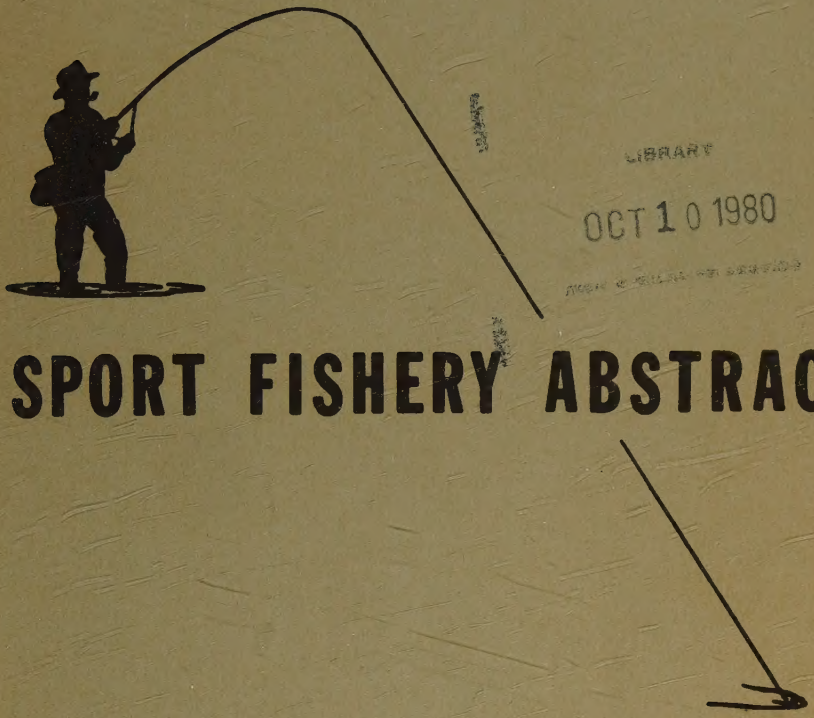

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# SPORT FISHERY ABSTRACTS

Vol. 25, No. 3, 1980

DEPARTMENT OF THE INTERIOR
U. S. FISH AND WILDLIFE SERVICE

UNITED STATES DEPARTMENT OF THE INTERIOR
CECIL D. ANDRUS, SECRETARY

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*Fish and Wildlife Service, Lynn A. Greenwalt, Director*

# SPORT FISHERY ABSTRACTS

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Fort Collins, Colorado 80523

*Sport Fishery Abstracts* is intended to furnish fishery biologists with abstracts of current literature in sport fishery research and management.

One volume, consisting of four numbers, is issued each year. Each number contains separate Author, Geographic, and Taxonomic indexes, and the final number of each volume contains cumulative Author, Geographic, Taxonomic, and Subject indexes, and a list of publications screened. Authors who publish in journals not screened for *Sport Fishery Abstracts*, and who would like their publications included, should submit abstracts to the Editor.

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# SPORT FISHERY ABSTRACTS

**An abstracting service for fishery research and management**

Volume 25 Number 3 1980

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## GENERAL FISH CULTURE

80-001825 Chien, Y.-H. and J. W. Avault, Jr. PRODUCTION OF CRAYFISH IN RICE FIELDS. *Prog. Fish-Cult.* 42(2):67-71. Apr. 1980. SFA 25(3)
[Sch. For. Wildl. Manage., La. State Univ., Baton Rouge 70803]

## TROUT AND SALMON CULTURE

80-001826 Griffin, J. J. A SIMULATION MODEL OF A SALMONID REARING FACILITY. *Ph.D. dissertation, Univ. R.I.* 396p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(12, part 1):5502. June 1980. SFA 25(3)

The efficient rearing of salmonid fishes has become important both for the replenishment of natural stocks for commercial and recreational catch and for direct market sales. High production facilities are currently operational in Scandinavia (Norway and Sweden), Canada and the U.S. (northeast, west and Alaska). Smaller hatcheries are operating in countries ranging from Great Britain, Iceland and Korea to Chile and New Zealand. Early interest centered on survival, first to smoltification and release size and later through sea return. The present cost of facilities and operations and the required rates of financial return to the investor emphasize the need for optimized operation. In this study, aspects of fish hatchery operations and optimization processes have been investigated in an effort to derive a useful analytical and predictive tool. A descriptive model, designed to parameterize critical biological, physical and financial elements of the rearing process over ranges experienced within the hatchery has been developed and applied in a general way to West Coast hatchery data and more specifically to the Quinebaug hatchery in Plainfield, Connecticut. This particular hatchery configuration was used as a base point for establishment of critical model elements as well as investigation of its present configuration and extension of that capability beyond current equipment and technique limits. In the model, growth is described as a function of ration, water temperature and organism weight and related to oxygen requirements, metabolic output, and resultant water requirements. Species specific mortality functions are derived. Stochastic elements relating to temperature, ration, growth and mortality are incorporated into the model. The methodology involves minimizing the costs of production of new protein by least-cost mixes of water temperature and ration, considering labor, capital, pumping and other costs. Internal cost elements are computed. Financial output (return on sales and return on investment), yearly operational matrices and appropriate plots are produced to allow ranking and relative quantification of operational strategies. In order to demonstrate that the parameters and relationships determined for the baseline operation are realistic and to demonstrate the usefulness of models for analyzing a hatchery, the elements of the simulation model were operated stochastically and compared to actual hatchery performance. A separate stochastic weather submodel was developed and applied to prediction of growth. The advantages of full and even plant loading, increased delivery weight, especially with heat addition and water recirculation, were evident for model runs. Oil and solar heating sources are compared. A stochastic unforeseen risk assessment methodology is suggested. The use of such a model in the planning and hatchery operations activity is discussed, and an example of on-line linear programming for real time use is provided.

WARMWATER CULTURE

80-001827 Anonymous. PROGRESS REPORT OF THE FRESHWATER AQUACULTURE CENTER. *Cent. Luzon State Univ. Freshwater Aquacult. Cent. Prog. Rep. Tech. Rep.* No. 13. v + 66p. 1978. SFA 25(3)
[Freshwater Aquacult. Cent., Cent. Luzon State Univ., Muñoz, Nueva Ecija 2320, Philippines] A collection of papers.--RS

80-001828 Broussard, M. C., Jr. THE EVALUATION OF FOUR STRAINS OF CHANNEL CATFISH, *ICTALURUS PUNCTATUS*, AND INTRASPECIFIC HYBRIDS UNDER AQUACULTURAL CONDITIONS. *Ph.D. dissertation, Tex. A&M Univ.* 75p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(12, part 1):5478. June 1980. SFA 25(3)
[Channel catfish from two domestic strains and two wild strains, and intraspecific crosses between strains were evaluated under aquacultural conditions. Growth studies were conducted in tanks, cages, and communal ponds. Reproductive characters including spawning time, egg size, hatchability, and percent deformed fry were evaluated for each strain or cross. Correlations were also determined for reproductive characters and growth characters. Different strains of channel catfish had different peak spawning periods indicating possible genetic control. Hatchability was an extremely variable trait and no differences among strains or crosses could be domonstrated. Environmental factors may have overshadowed genetic factors affecting the frequency of deformed fry. No differences among strains or crosses could be deomonstrated for the percent of deformed fry. Deformed individuals had lower survival rates in ponds. The total weight of a spawn and the number of eggs/spawn were positively correlated to the weight of the female broodfish; egg weight was negatively correlated to the weight of the female broodfish. Egg weight was not correlated to hatchability or initial weight. However, initial weight was correlated to total weight during the first 60 days of growth in tanks. Domestic strains had superior growth rate compared to wild strains in ponds and cages. No heterosis for growth rates in ponds and cages could be demonstrated for crosses between domestic strains, or crosses between domestic and wild strains. There were no significant differences for percent survival in ponds and cages, and no consistent differences for dress-out percent. Initial variation for length and weight among strains or crosses were reduced during the growing season.

80-001829 Brown, E. E. BAIT FISH FARMING. *Riv. It. Piscic. Ittiop.* 15(1):7-10. Jan.-Feb.-Mar. 1980. In English and Italian. SFA 25(3)
[Dep. Agric. Econ., Univ. Ga., Athens 30602]

80-001830 Cremer, M. C. and R. O. Smitherman. FOOD HABITS AND GROWTH OF SILVER AND BIGHEAD CARP IN CAGES AND PONDS. *Aquaculture* 20(1):57-64. May 1980. SFA 25(3)
[Dep. Fish. Allied Aquacult., Auburn Univ. Agric. Exp. Stn., Auburn, AL 36830] Analysis of intestinal contents of silver carp (*Hypophthalmichthys molitrix*) and bighead carp (*Aristichthys nobilis*) showed that silver carp consumed primarily phytoplankton while bighead carp consumed large quantities of zooplankton and detritus in addition to phytoplankton. The size of particles filtered by the bighead carp was larger (17-3,000 µm) than that filtered by silver carp (8-100 µm). Artificial feed was readily consumed by bighead carp but not by silver carp. No growth difference was indicated for silver carp in fertilized ponds and ponds receiving artificial feed. Growth of bighead carp increased substantially with the addition of artifical feed. Silver carp grew more rapidly in cages than bighead carp.

WARMWATER CULTURE (CONTINUED)

80-001831 Green, L. C. and J. R. Merrick. TROPICAL FRESHWATER FISH CULTURE: A COVERED POND IMPROVES PLANKTON AND FRY PRODUCTION. *Aquaculture* 19(4):389-394. Apr. 1980. SFA 25(3)

[28 Miva St., Cooray, Queensland 4563, Australia] Existing open planketon pond techniques employed in Australian warm-water fish culture are outlined. The development of the covered plankton pond is traced and details of materials used, management and production over an 18-month period provided. The advantages of covered ponds, improved design features for further work and the significance of techniques developed are briefly discussed.

80-001832 Horváth, L. USE OF A PROTEOLYTIC ENZYME TO IMPROVE INCUBATION OF EGGS OF THE EUROPEAN CATFISH. *Prog. Fish-Cult.* 42(2):110-111. Apr. 1980. SFA 25(3)

[Warmwater Fish Hatchery, Százhalombatta, P.O. Box 28, Hungary 2441]

80-001833 Lopez, J. V. and B. S. Ranoemihardjo. POLYCULTURE OF MILKFISH (*CHANOS CHANOS*) AND SHRIMP (*PENAEUS MONODON*) TO INCREASE PRODUCTION IN PONDS. *Bull. Brackishwater Aquacult. Dev. Cent. (Jepara)* 4(1-2):268-277. Jan.-July 1978. SFA 25(3)

[Brackishwater Aquacult. Dev. Cent., Jepara, Indonesia] The culture of milkfish (*Chanos chanos*) and giant tiger shrimp (*Penaeus monodon*) in the same pond compartment could increase production from 300 to 1800 kg/ha/yr. Implementation of the activities arranged in chronological order relative to the rearing of these cultivable and economic species is expected to produce 1200 kg of milkfish and 600 kg of shrimp, *P. monodon*.

80-001834 Nagy, A.; V. Csanyi; J. Bakos; and L. Horvath. DEVELOPMENT OF A SHORT-TERM LABORATORY SYSTEM FOR THE EVALUATION OF CARP GROWTH IN PONDS. *Bamidgeh* 32(1):6-15. Mar. 1980. SFA 25(3)

[Lab. Behav. Genet., L. Eötvos Univ., 2131 Göd, Hungary] The first step towards creating a laboratory test-system for the mass characterization of carp growth in ponds is reported. Growth values of experimental populations were established both in the laboratory and under field conditions. A method was developed for measurement of tolerance to hypoxia. Heritabilities of the characteristics examined have been determined. A high correlation was found between various growth parameters and the extent of hypoxia tolerance.

80-001835 Papoutsoglou, S. E.; E. G. Papaparaskeva-Papoutsoglou and P. K. Dendrinos. STUDIES ON THE EFFECT OF DENSITY ON BODY COMPOSITION, GROWTH RATE AND SURVIVAL OF RAINBOW TROUT FRY, REARED IN SEMICLOSED SYSTEM. *Thalassographica* 3(1):43-56. Nov. 1979. In English with Greek summ. SFA 25(3)

[Dep. Appl. Hydrobiol., Agric. Univ. Coll. Athens, Iera Odos 75, Votanicos, Athens, Greece]

80-001836 PROGRESS REPORT OF THE FRESHWATER AQUACULTURE CENTER. *Cent. Luzon State Univ. Freshwater Aquacult. Cent. Tech. Rep.* No. 15 iv + 121p. 1979. SFA 25(3)

[Freshwater Aquacult. Cent., Cent. Luzon State Univ., Muñoz, Nueva Ecija 2320, Philippines] A collection of papers.--RS

80-001837 Wohlfarth, G. W.; M. Lahman; G. Hulata and R. Moav. THE STORY OF "DOR-70," A SELECTED STRAIN OF THE ISRAELI COMMON CARP. *Bamidgeh* 32(1):3-5. Mar. 1980. SFA 25(3)

[Fish Aquacult. Stn., Dor, Israel]

WARMWATER CULTURE (CONTINUED)

80-001838 Zerunian, S. ACCRESCIMENTO IN CONDIZIONI NATURALI ED INTENSIVE DEL PERSICO TROTA (*MICROPTERUS SALMOIDES*) NEL BASSO LAZIO. [GROWTH OF LARGEMOUTH BASS (*MICROPTERUS SALMOIDES*) REARED IN POND AND IN CAGES IN SOUTHERN LATIUM (CENTRAL ITALY).] *Riv. It. Piscic. Ittiop.* 15(1):13-16. Jan.-Feb.-Mar. 1980. In Italian with English summ. SFA 25(3)

[Data concerning the growth of largemouth bass (*Micropterus salmoides*) in a natural pond located in southern Latium are reported. Good growth (mean weight at 2 years 600 g) as well as predation on the pumpkinseed sunfish (*Lepomis gibbosus*)--an undesirable species generally discarded by other carnivorous fish--are worth being stressed. An experiment of cultivation in submerged cages starting from a size of 4-5 cm was also carried out. Good acceptance of food, rapid growth (80 g attained on the average at 2 months), and lack of mortality were observed. These positive results are to be considered as a first step towards an intensive culture of the largemouth bass up to the market size.

MARICULTURE

80-001839 Hussain, N. A. and M. Higuchi. LARVAL REARING AND DEVELOPMENT OF THE BROWN SPOTTED GROUPER, *EPINEPHELUS TAUVINA* (FORSKÅL). *Aquaculture* 19(4):339-350. Apr. 1980. SFA 25(3)

[Maricult. Fish. Dep., Kuwait Inst. Sci. Res., P.O. Box 1638, Salmiya, Kuwait] *Epinephelus tauvina* (Forsål) has spawned naturally in captivity. The larvae were reared to metamorphosis using rotifers, *Artemia* nauplii, copepods and minced shrimp meat. The developmental stages from hatching through to metamorphosis are described. Larvae grew from 2.25 mm total length at hatching, to 31.40 mm by day 50. Two mortality peaks were observed: the first between days 4 and 5, and the second between days 24 and 35. The first peak corresponded to first feeding and the unsuitability of rotifiers, and the second to the change from feeding *Artemia* nauplii to copepods, which were not available in sufficient quantities.

FEEDS, FEEDING, AND NUTRITION

80-001840 Ablett, R. F. and R. H. Richards. SUITABILITY OF TWENTY-FOUR-HOUR AND FORTY-EIGHT-HOUR UNFED *ARTEMIA* AS AN EARLY FOODSTUFF FOR '0' GROUP DOVER SOLE (*SOLEA SOLEA* L.) PRODUCTION. *Aquaculture* 19(4):371-377. Apr. 1980. SFA 25(3)

[Dep. Food Sci. Technol., Oreg. State Univ., Corvallis 97331] A growth trial was conducted to assess the usefulness of two unfed *Artemia* nauplii regimes for '0' group Dover sole cultivation. San Francisco strain *Artemia salina*, harvested at either 24 h (30°C) and/or 48 hr (23°C), were investigated with sole between day 20 and day 85 post spawning. At day 60, a proportion of the fish from each trial was weaned onto *Lumbricillus* spp., an oligochaete used as a second stage foodstuff at Hunterston, Scotland. The results showed a pronounced growth increase in fish fed with 24-h *Artemia* compared to those reared on 48-h *Artemia*. *Lumbricillus* weaning produced a superior growth rate compared to both *Artemia* regimes, but had little effect on the growth differences established during *Artemia* feeding.

80-001841 Bromley, P. J. THE EFFECT OF DIETARY WATER CONTENT AND FEEDING RATE ON THE GROWTH AND FOOD CONVERSION EFFICIENCY OF TURBOT (*SCOPHTHALMUS MAXIMUS* L.). *Aquaculture* 20(2):91-99. June 1980. SFA 25(3)

[Minist. Agric. Fish. Food, Fish. Lab., Pakefield, Lowestoft, Suffolk, NR33 OHT, England]

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

80-001842 Bromley, P. J. EFFECT OF DIETARY PROTEIN, LIPID AND ENERGY CONTENT ON THE GROWTH OF TURBOT (*SCOPHTHALMUS MAXIMUS* L.). *Aquaculture* 19(4):359-369. Apr. 1980. SFA 25(3)

[Minist. Agric. Fish. Food, Fish. Lab., Pakefield, Lowestoft, Suffolk, England] Juvenile turbot were fed diets containing various proportions of protein and lipid. The fastest growth occurred on a diet rich in protein and low in lipd. The addition of extra lipid to the diet gave poorer growth but improved protein conversion efficiency. The protein sparing action of the lipid was most pronounced when the turbot were fed to about three-quarters of satiation on a diet supplemented with 6% lipid. Under these conditions 42% of the dietary protein was converted into fish protein, compared with 32% conversion on the basic diet which contained 0.5% lipid. There was a general decline in food conversion efficiency and protein sparing was marginal at the satiation feeding rate. Not all the dietary lipid was used in a protein sparing role, much of it was deposited as lipid reserves. In contrast, there was very little increase in the lipid content of fish fed on a high protein--low lipid diet.

80-001843 Fowler, L. G. SUBSTITUTION OF SOYBEAN AND COTTONSEED PRODUCTS FOR FISH MEAL IN DIETS FED TO CHINOOK AND COHO SALMON. *Prog. Fish-Cult.* 42(2):87-91. Apr. 1980. SFA 25(3)

[U.S. Fish Wildl. Serv., Abernathy Salmon Cult. Dev. Cent., Longview, WA 98632]

80-001844 Furuichi, M. and Y. Yone. EFFECT OF DIETARY DEXTRIN LEVELS ON THE GROWTH AND FEED EFFICIENCY, THE CHEMICAL COMPOSITION OF LIVER AND DORSAL MUSCLE, AND THE ABSORPTION OF DIETARY PROTEIN AND DEXTRIN IN FISHES. *Bull. Jpn. Soc. Sci. Fish.* 46(2):225-229. Feb. 1980. SFA 25(3)

[Fish. Res. Lab., Kyushu Univ., Tsuyazaki, Fukuoka 811-33, Japan] In order to investigate the utilization of carbohydrate by carp, (*Cyprinus carpio*, red sea bream, *Chrysophrys major*, and yellow tail, *Seriola quinqueradiata*, the fishes were reared on diets containing 0%, 10%, 20%, 30% and 40% dextrin for 30 days. Growth retardation and low feed efficiency were noticed in carp fed on a 40% dextrin diet, red sea bream on 30% dextrin and yellow tail on 20% dextrin. The rates of the increase in liver glycogen and the decrease in liver and muscle lipid were lowest in carp. On the other hand, comparably high percent absorption of protein and dextrin was determined in all species regardless of dietary dextrin levels. From these findings, it is presumed that the low growth and feed efficiency resulting from feeding high dextrin diets might be caused by the poor capability of utilizing the absorbed dextrin, and that the capacity of carp is highest among the fish tested.

80-001845 Johnson, E. A.; T. G. Villa; M. J. Lewis. *PHAFFIA RHODOZYMA* AS AN ASTAXANTHIN SOURCE IN SALMONID DIETS. *Aquaculture* 20(2):123-134. June 1980. SFA 25(3)

[Dep. Nutr. Food Sci., Mass. Inst. Technol., Cambridge 02139]

80-001846 Mahnken, C. V. W.; J. Spinelli and F. W. Waknitz. EVALUATION OF AN ALKANE YEAST (*CANDIDA* SP.) AS A SUBSTITUTE FOR FISH MEAL IN OREGON MOIST PELLET: FEEDING TRIALS WITH COHO SALMON (*ONCHORHYNCHUS KISUTCH*) AND RAINBOW TROUT (*SALMO GAIRDNERI*). *Aquaculture* 20(1):41-56. May 1980. SFA 25(3)

[Coastal Zone Estuarine Stud. Div., NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112] Up to 40% of the fish meal portion of the Oregon Moist Pellet (OMP) was replaced with up to 40% alkane yeast single cell protein (22% of dietary protein) in diets fed to rainbow trout in fresh water, and up to 100% of the fish meal portion was replaced with alkane yeast (54% of dietary protein) in OMP diets fed to coho salmon in salt water. Salmon diets were supplemented with DL-methionine to correct for a suspected

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

80-001846 CONTINUED deficiency in this essential amino acid. Alkane yeast was an acceptable substitute for fish meal at all levels tested in trout. Only 25% yeast substitution was judged to be acceptable in the OMP diet for marine-cultured coho salmon, causing less than 4% reduction in growth. In marine-cultured coho salmon, growth was depressed further at fish meal substitution levels greater than 25%, while supplementation with DL-methionine enhanced growth and feed conversion only slightly.

80-001847 Ogino, C. [PROTEIN REQUIREMENTS OF CARP AND RAINBOW TROUT.] *Bull. Jpn. Soc. Sci. Fish.* 46(3):385-388. Feb. 1980. In Japanese with English summ. SFA 25(3)
[Lab. Fish. Nutr., Tokyo Univ. Fish., Konan 4, Minato-ku, Tokyo 108, Japan]

80-001848 Ogino, C. [REQUIREMENTS OF CARP AND RAINBOW TROUT FOR ESSENTIAL AMINO ACIDS.] *Bull. Jpn. Soc. Sci. Fish.* 46(2):171-174. Feb. 1980. In Japanese with English summ. SFA 25(3)
[Lab. Fish Nutr., Tokyo Univ. Fish., Konan 4, Minato-ku, Tokyo 108, Japan]

80-001849 Poston, H. A. and G. F. Combs, Jr. NUTRITIONAL IMPLICATIONS OF TRYPTOPHAN CATABOLIZING ENZYMES IN SEVERAL SPECIES OF TROUT AND SALMON. *Proc. Soc. Exp. Biol. Med.* 163(4):452-454. 1980. SFA 25(3)
[U.S. FWS, Tunison Lab. Fish. Nutr., Cortland, NY 13045]

80-001850 Reinitz, G. GROWTH AND SURVIVAL OF LAKE TROUT FED EXPERIMENTAL STARTER DIETS. *Prog. Fish-Cult.* 42(2):100-102. Apr. 1980. SFA 25(3)
[U.S. FWS, Rt. 1, Box 205, Spearfish, SD 57783]

80-001851 Reinitz, G. SOYBEAN MEAL AS A SUBSTITUTE FOR HERRING MEAL IN PRACTICAL DIETS FOR RAINBOW TROUT. *Prog. Fish-Cult.* 42(2):103-106. Apr. 1980. SFA 25(3)
[U.S. FWS, Rt. 1, Box 205, Spearfish, SD 57783]

80-001852 Schroeder, G. L. THE BREAKDOWN OF FEEDING NICHES IN FISH PONDS UNDER CONDITIONS OF SEVERE COMPETITION. *Bamidgeh* 32(1):20-24. Mar. 1980. SFA 25(3)
[Fish. Aquacult. Res. Stn., Dor, Israel] The extreme competition for natural feeds in densely stocked fish ponds drastically reduces standing stock as well as the production of organisms considered to occupy the various feed niches. To satisfy their dietary needs, fish of different feeding characteristics are thereby forced to be dependent upon food from sources not selected under normal conditions. The result is a shift to consumption of microorganisms of lower trophic level.

80-001853 Seidel, C. R.; P. S. Schauer; T. Katayama and K. L. Simpson. CULTURE OF ATLANTIC SILVERSIDES FED ON ARTIFICIAL DIETS AND BRINE SHRIMP NAUPLII. *Bull. Jpn. Soc. Sci. Fish.* 46(2):237-245. Feb. 1980. SFA 25(3)
[Dep. Food Sci. Technol. Nutr. Diet., Univ. R.I., Kingston 02881] In a joint study, live, unfed, 3-day-old brine shrimp, *Artemia salina*, and artificial, flake diets were fed to Atlantic silversides, *Menidia menidia*, either separately or in various combination. The combination diets also varied in proportion of live to artificial components. After each experiment was terminated, growth and survival of the silversides were determined and analyses were made for amino acid and fatty acid composition. Overall growth and survival data showed that unstressed fish could be cultured on a combination of artificial + brine shrimp diet in as little as a 7:1 day (artificial: brine shrimp) feeding ratio. Biochemical data were compared to reported requirement levels for essential amino acids and essential fatty acids in marine fish, and it was concluded that all diets

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

80-001853 CONTINUED seemed adequate in these two components. These data also indicated that fish accepted both artificial and live diets equally. Results further showed that dietary amino acids were generally not stored by silversides beyond levels required for tissue formation, whereas dietary fatty acids were accumulated to a much greater degree. Atlantic silversides cultured on an artificial diet alone, exhibited poorer growth and survival than fish cultured exclusively on a live brine shrimp diet. Although the reason for the live diet's nutritive superiority remains a question, our results seem to eliminate an amino acid, fatty acid or digestive enzyme as the key to promoting good growth.

80-001854 Takeuchi, T.; S. Arai; T. Watanabe and Y. Shimma. [REQUIREMENT OF EEL *ANGUILLA JAPONICA* FOR ESSENTIAL FATTY ACIDS.] *Bull. Jpn. Soc. Sci. Fish.* 46(3):345-353. Feb. 1980. In Japanese with English summ. SFA 25(3)
[Lab. Fish. Nutr., Tokyo Univ. Fish., Konan 4, Minato-ku, Tokyo 108, Japan]

80-001855 Watanabe, T.; A. Murakami; L. Takeuchi; T. Nose and C. Ogino. REQUIREMENT OF CHUM SALMON HELD IN FRESHWATER FOR DIETARY PHOSPHORUS. *Bull. Jpn. Soc. Sci. Fish.* 46(3):361-367. Feb. 1980. SFA 25(3)
[Lab. Fish. Nutr., Tokyo Univ. Fish., Konan 4, Minato-ku, Tokyo 108, Japan]

TRANSPORTING FISH

80-001856 Bogdan, E. and D. Waluga. THE EFFECT OF TRANSPORT ON THE QUALITY OF EEL STOCKING MATERIAL. *Aquaculature* 20(2):139-146. June 1980. SFA 25(3)
[Inland Fish. Inst., Olsztyn, Poland]

80-001857 Hamid, S. N. and M. Mardjono. TRANSPORTING AND HOLDING MILKFISH FRY TO GET BETTER SURVIVAL RATE. *Bull. Brackishwater Aquacult. Dev. Cent. (Jepara)* 4(1-2):258-267. Jan.-July 1978. SFA 25(3)
[Brachishwater Aquacult. Dev. Cent., Jepara, Indonesia] Milkfish fry are transported to fishponds by using oxygenated plastic bags. At the density of 1000 - 2000 fry per litre for 8-12 hours transportation time, more than 90 percent survival was obtained. Fry storage provided with flowing water in the proper salinity improved the quality of fry. Better survival rate was also noted when egg yolk was used as feed compared to the pelletized feed. While in longer period of storage in 2 m by 4 m wooden box with the use of pelletized feed, the result was 90 percent survival rate of stronger milkfish fry.

80-001858 Specker, J. L. and C. B. Schreck. STRESS RESPONSES TO TRANSPORTATION AND FITNESS FOR MARINE SURVIVAL IN COHO SALMON (*ONCORHYNCHUS KISUTCH*) SMOLTS. *Can. J. Fish. Aquatic Sci.* 37(5):765-769. May 1980. In English with French summ. SFA 25(3)
[Oreg. Coop. Fish. Res. Unit, Oreg. State Univ., Corvallis 97331]

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT

80-001859 Chung, K. S. COLD ANAETHESIA OF TROPICAL FISH. *Bull. Jpn. Soc. Sci. Fish.* 46(3):391. Feb. 1980. SFA 25(3)
[Inst. Oceanogr., Univ. Oriente, Cumaná, Venezuela]

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT (CONTINUED)

80-001859 CONTINUED

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A collection of papers.--RS

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[Can. Cent. Inland Waters, 867 Lakeshore Rd., Burlington, ON L7R 4A6, Canada] A small but rugged, versatile current meter that was designed primarily as a peripheral tool in the small-craft sampling of plankton and larval fish is described. Only a single moving part, the rotor, is mechanically involved, and "on site" velocity and temperature information are obtained directly from the calibrated meter, or indirectly from chart and tape records. The current meter may be rigidly secured to plankton samplers, moored for *in situ* data collection, or simply hand-held for mobile operation. The instrument may find wide application with hydrobiologists and hydrologists.

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[Corvallis Environ. Res. Lab., U.S. EPA, 200 SW 35th St., Corvallis, OR 97330]

80-001866 Simons, T. J. CIRCULATION MODELS OF LAKES AND INLAND SEAS. *Can. Bull. Fish. Aquatic Sci.* 203. viii + 146p. 1980. SFA 25(3)
[Dep. Environ., Natl. Water Res. Inst., Burlington, ON L7R 4A6, Canada] The purpose of this monograph is to present a state-of-the-art report on models of large-scale water circulations in lakes and seas. Specifically, this review is intended to provide the necessary background information for

PHYSICAL LIMNOLOGY AND OCEANOGRAPHY (CONTINUED)

80-001866 CONTINUED investigations of material transports and water quality problems in large natural basins. In view of the multidisciplinary nature of such studies, treatment of the present material starts from basic physical and mathematical principles. Following a review of the fundamental equations and approximations used in large-scale circulation models, vertical and horizontal variations of three-dimensional water motions are considered more or less separately. With regard to the vertical dependence, a review is presented of various layered model configuations as well as analytical solutions for vertical current variations. The latter discussion deals with frictional effects in homogeneous water and normal modes of stratified basins. Treatment of horizontal flow patterns begins with a review of numerical solution techniques applicable to high-speed computers. Model solutions are then presented for steady-state circulations in homogeneous basins, time-dependent homogeneous circulations, and stratified circulations. In each case the discussion proceeds from analytical solutions for idealized basin configuations to numerical results and model verifications for natural basins. It is concluded that presently available models render adequate simulations of the response of natural basins to wind forcing, but that results of long-term simulations appear less conclusive.

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80-001869 Rudd, J. W. M.; M. A. Turner; B. E. Townsend; A. Swick and A. Furutani. DYNAMICS OF SELENIUM IN MERCURY-CONTAMINATED EXPERIMENTAL FRESHWATER ECOSYSTEMS. *Can. J. Fish. Aquatic Sci.* 37(5):848-857. May 1980. In English with French summ. SFA 25(3)
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[Dep. Bot., Coll. Arts Sci., Univ. Philippines at Los Baños, College, Laguna 3720, Philippines] Twenty-eight of the 156 species and varieties of algae identified in the fishponds and fishpens of Mayondon, Los Baños, Laguna, belong to Euglenophyta. These include 22 new records and 8 new varieties to make up a total of 49 species of euglenophytes known in the Philippines. Diagnostic descriptions, illustrations, and habitat records are given for each species or variety. A key is presented.

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[Zool. Lab., Univ. Aarhus, Denmark] The snout of a sturgeon, *Acipenser ruthenus* (Chondrostei, Osteichthyes) is provided with sensory pores. Light and electron microscopical examination of these reveals that the ampullary organs have a sensory epithelium very similar to what has been found in the Lorenzinian ampullae, which are electroreceptors previously examined at a fine structural level in elasmobranchs and the paddlefish, *Polyodon spathula*. The sensory cells are pear-shaped with a very small apical part, in the centre of which there is a short cilium. Basally, the sensory cells make several contacts with button-shaped nerve-endings. The presumed synaptic area in the sensory cell is characterized by a presynaptic sheet surrounded by vesicles. Only one type of nerve ending, an afferent type, has been observed.

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[Norwegian Food Res. Inst., P.O. Box 50, N-1432 Ås-NLH, Norway] The ultrastructural details of Z-discs from red, intermediate, and white axial muscle fibres from the sharks *Etmopterus spinax* and *Galeus melastomus* are described. Red fibre Z-discs contain the most amorphous matrix material, and are thicker (100-115 nm) than intermediate (85-88 nm) and white Z-disks (75-80 nm). Four sets of oblique bars extend tangentially from each thin filament. In each set two bars are present, those of white fibres are close together (approximately 5 nm), while those of red fibres are separated by a distance of 15 nm. A model of shark Z-disc structure is proposed. The denaturation (heat transaction) temperature of the muscle proteins were studied by differential scanning calorimetry (DSC). The heat transitions of collagen, actin, and myosin were identified; the actin heat transition temperature increased in the sequence red, intermediate, and white. The total protein pattern of red and white muscle were studied by SDS electrophoresis. A protein with a molecular weight of about 55,000 may represent a Z-disc protein.

80-001920 Srivastava, C. B. L. and M. Singh. OCCURRENCE OF CAROTID LABYRINTH IN THE CATFISH GROUP OF TELEOST FISHES. *Experiencia (Basel)* 36(6):651-653. 15 June 1980. SFA 25(3)

[Dep. Zool., Univ. Allahabad, Allahabad, India]

80-001921 Taubert, B. D. and M. J. Dadswell. DESCRIPTION OF SOME LARVAL SHORTNOSE STURGEON (*ACIPENSER BREVIROSTRUM*) FROM THE HOLYOKE POOL, CONNECTICUT RIVER, MASSACHUSETTS, U.S.A., AND THE SAINT JOHN RIVER, NEW BRUNSWICK, CANADA. *Can. J. Zool.* 58(6):1125-1128. June 1980. In English with French summ. SFA 25(3)

[Ill. State Nat. Hist. Surv., Aquatic Biol. Sect., Nat. Resour. Bldg., Urbana 61801] Shortnose sturgeon (*Acipenser brevirostrum*) protolarvae, ranging from 8.0 to 12.5 mm TL, had 20-23 postanal and 33-36 preanal myomeres and the preanal length was 66-70% of TL. The yolk sac was large, the pectoral fin buds were barely visible, and the entire body was covered with expanded melanophores. Mesolvarvae of 13.0-14.7 mm TL had 22 postanal and 34 preanal myomeres, and preanal length was 61% of TL. The yoke sac was nearly gone, barbels, mouth, and pectoral fins were well developed and the anlage of the dorsal fin was visible. Mouth width of the 14.7 mm TL mesolarva was 71% of the head width and teeth were present.

80-001922 Tiffany, W. J. III; R. E. Pelham and F. W. Howell. HYPEROSTOSIS IN FLORIDA FOSSIL FISHES. *Fla. Sci.* 43(1):44-49. 1980. SFA 25(3)

[Mote Mar. Lab., 1600 City Island Park, Sarasota, FL 33577]

80-001923 Touart, L. W. and S. A. Bortone. THE ACCESSORY REPRODUCTIVE STRUCTURE IN THE SIMULTANEOUS HERMAPHRODITE *DIPLECTRUM BIVITTATUM*. *J. Fish Biol.* 16(4):397-403. Apr. 1980. SFA 25(3)

[U.S. EPA, Hazard Eval. Div., TS-769, 401 M Street SW, Washington, DC 20460]

80-001924 Trier, J. S. and P. C. Moxey. EPITHELIAL CELL PROLIFERAITON IN THE INTESTINE OF THE WINTER FLOUNDER, *PSEUDOPLEURONECTES AMERICANUS*. *Cell Tissue Res.* 206(3):379-385. Mar. 1980. SFA 25(3)

[Dep. Med., Peter Bent Brigham Hosp., 721 Huntington Ave., Boston, MA 02115]

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[Dep. Morphol., Zool. Lab., Univ. Leiden, The Netherlands]

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[Dep. Ichthyol., Moscow Univ., USSR]

80-001927 Watson, A. H. D. THE DISTRIBUTION OF AMINERGIC NEURONES AND THEIR PROJECTIONS IN THE BRAIN OF THE TELEOST, *MYOXOCEPHALUS SCORPIUS*. *Cell Tissue Res.* 208(2):299-312. 1980. SFA 25(3)
[Gatty Mar. Lab., St. Andrews Univ., St. Andrews, Fife, Scotland]

80-001928 Yefremenko, V. N. A DESCRIPTION OF THE LARVAE OF *BATHYLAGUS ANTARCTICUS* (BATHYLAGIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):156-160. 1979. SFA 25(3)
[VNIRO, Moscow, USSR]

PHYSIOLOGY

80-001929 Alexander, N.; R. M. Laurs; M. McIntosh and S. R. Russell. HAEMATOLOGICAL CHARACTERISTICS OF ALBACORE, *THUNNUS ALALUNGA* (BONNATERRE), AND SKIPJACK, *KATSUWONUS PELAMIS* (LINNAEUS). *J. Fish Biol.* 16(4):383-395. Apr. 1980. SFA 25(3)
[R. M. Laurs: NMFS, La Jolla, CA 92038]

80-001930 Algranati, F. D. ROLE OF SEX ATTRACTANT PHEROMONE(S) ON SPAWNING AGGREGATION IN THE ZEBRAFISH, *BRACHYDANIO RERIO*: ITS ISOLATION AND PARTIAL PURIFICATION. *Ph.D. dissertation, N.Y. Univ.* 108p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(11):5107. May 1980. SFA 25(3)

80-001931 Amirkhanov, G. A. THE DYNAMICS OF FREE AMINO ACID CONTENT DURING THE EMBRYONIC DEVELOPMENT OF THE STURGEON, *ACIPENSER GULDENSTADTI*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):127-132. 1979. SFA 25(3)
[Dagestan Pedagogic Inst., Makhachkala, USSR]

80-001932 Badcock, J. and R. A. Larcombe. THE SEQUENCE OF PHOTOPHORE DEVELOPMENT IN *XENODERMICHTHYS COPEI* (PISCES: ALEPOCEPHALIDAE). *J. Mar. Biol. Assoc. U.K.* 60(2):277-294. May 1980. SFA 25(3)
[Inst. Oceanogr. Sci., Wormley, Surrey, England]

80-001933 Bailey, J. R. RENAL CONTROL OF RENIN SECRETION AND SOME ACTIONS OF THE ANGIOTENSINS IN THE KIDNEY OF THE TELEOST *SALMO GAIRDNERI*. *Ph.D. dissertation, Univ. British Columbia* 1979. From Diss. Abstr. Int. B Sci. Eng. 40(11):5166. May 1980. SFA 25(3)

80-001934 Barton, B. A.; R. E. Peter and C. R. Paulencu. PLASMA CORTISOL LEVELS OF FINGERLING RAINBOW TROUT (*SALMO GAIRDNERI*) AT REST, AND SUBJECTED TO HANDLING, CONFINEMENT, TRANSPORT, AND STOCKING. *Can. J. Fish.*

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80-001934 CONTINUED *Aquatic Sci.* 37(5):805-811. May 1980. In English with French summ. SFA 25(3)
[Fish Wildl. Div., Alberta Energy Nat. Resour., Sam Livingston Fish Hatchery, Calgary, AB T2G 4T9, Canada]

80-001935 Belloc, F. and J.-L. Gallis. FRESH WATER ADAPTATION IN THE EURYHALINE TELEOST, *CHELON LABROSUS*--III. BIOCHEMICAL CHARACTERIZATION AND INCREASE IN THE ACID PHOSPHATASE ACTIVITY IN GILL. *Comp. Biochem. Physiol. A Comp. Physiol.* 65(4):433-437. 1980. SFA 25(3)
[J.-L. Gallis: Inst. Univ. Biol. Mar., 2 rue du Pr. Jolyet, 33120 Arcachon, France]

80-001936 Benjamin, M. A CORRELATION BETWEEN PITUITARY AND INTEGUMENTARY STRUCTURE IN THE NINE-SPINED STICKLEBACK, *PUNGITIUS PUNGITIUS* L. *Acta Zool. (Stockh.)* 61(2):105-109. 1980. SFA 25(3)
[Dep. Anat., Univ. Coll., Cardiff, Wales]

80-001937 Beumer, J. P. TEMPERATURE AND SALINITY TOLERANCE OF THE SPANGLED PERCH *THERAPON UNICOLOR* GUNTHER, 1859 AND THE EAST QUEENSLAND RAINBOWFISH *NEMATOCENTRIS SPLENDIDA* PETERS, 1866. *Proc. R. Soc. Queensl.* 90:85-91. 15 Feb. 1979. SFA 25(3)
[Arthur Rylah Inst. Environ. Res., Brown St., Heidelberg, Victoria, Australia] Adult and juvenile *Therapon unicolor* and adult and juvenile *Nematocentris splendida* have been found to tolerate temperatures of 41.8°C, 35.5°C, 34.4°C and 31.4°C respectively. These upper temperature tolerance limits were calculated as $LD_{50}$ values from percentage survival curves. Salinity tolerances determined by direct transfer, gradual acclimation and long-term tolerance, show that *T. unicolor* tolerates salinities as high as 35.5°/oo while *N. splendida* could not tolerate salinities higher than 17.8°/oo. Attempts to induce aestivation in *T. unicolor* were unsuccessful.

80-001938 Bieniarz, K.; P. Epler; Luong-ngoc-Thuy and B. Breton. CHANGES IN BLOOD GONADOTROPIN LEVEL IN MATURE FEMALE CARP FOLLOWING HYPOPHYSIAL HOMOGENATE INJECTIONS. *Aquaculture* 20(1):65-69. May 1980. SFA 25(3)
[Acad. Agric., Krakow, Al. Mickiewicza 24/28, Poland]

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[Lab. Comp. Physiol., Univ. Utrecht, Jan van Galenstraat 40, NL-3572 LA Utrecht, The Netherlands]

80-001940 Broun, G. R.; O. B. Il'inskii; V. M. Muraveiko; P. A. Morozov; V. P. Fomenko; and G. A. Fonarev. PERCEPTION OF ELECTRIC FIELDS OF SEA WAVES BY ELECTRORECEPTORS OF THE AMPULLAE OF LORENZINI. *Dokl. Biol. Sci. (Engl. Transl. Dokl. Akad. Nauk SSSR Ser. Biol.)* 248(1-6):1144-1145. Mar. 1980. SFA 25(3)
[I.P. Pavlov Inst. Physiol., Acad. Sci. USSR, Leningrad, USSR]

80-001941 Bruce, R. W. PROTOGYNOUS HERMAPHRODITISM IN TWO MARINE ANGELFISHES. *Copeia* 1980(2):353-355. 1 May 1980. SFA 25(3)
[Dep. Zool., Univ. Glasgow, G12 8QQ, Ireland]

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80-001942 Bye, V. J.; B. Breton and R. Billard. IMMUNOLOGICAL CROSS-REACTION BETWEEN PITUITARY GONADOTROPIN FROM NORTH ATLANTIC FISH. *Gen. Comp. Endocrinol.* 41(1):130-134. May 1980. SFA 25(3)
[Minist. Agric. Fish. Food, Fish. Lab., Lowestoft, Suffolk, England]

80-001943 Cameron, J. S. AUTONOMIC NERVOUS REGULATION OF THE HEART IN GOLDFISH. *Ph.D. dissertation, Univ. Mass.* 161p. 1980. From Diss. Abstr. Int. B Sci. Eng. 40(12, part 1):5553. June 1980. SFA 25(3)

80-001944 Campbell, C. M. and D. R. Idler. CHARACTERIZATION OF AN ESTRADIOL-INDUCED PROTEIN FROM RAINBOW TROUT SERUM AS VITELLOGENIN BY THE COMPOSITION AND RADIOIMMUNOLOGICAL CROSS REACTIVITY TO OVARIAN YOLK FRACTIONS. *Biol. Reprod.* 22(3):605-617. Apr. 1980. SFA 25(3)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

80-001945 Cannon, M. S.; H. H. Mollenhauer; A. M. Cannon; T. E. Eurell and D. H. Lewis. ULTRASTRUCTURAL LOCALIZATION OF PEROXIDASE ACTIVITY IN NEUTROPHIL LEUKOCYTES OF *ICTALURUS PUNCTATUS*. *Can. J. Zool.* 58(6):1139-1143. June 1980. In English with French summ. SFA 25(3)
[Dep. Anat., Coll. Med., Tex. A&M Univ., College Station 77843]

80-001946 Carlson, A. R.; J. Blocher and L. J. Herman. GROWTH AND SURVIVAL OF CHANNEL CATFISH AND YELLOW PERCH EXPOSED TO LOWERED CONSTANT AND DIURNALLY FLUCTUATING DISSOLVED OXYGEN CONCENTRATIONS. *Prog. Fish-Cult.* 42(2):73-78. Apr. 1980. SFA 25(3)
[U.S. EPA, 6201 Congdon Blvd., Duluth, MN 55804]

80-001947 Casterlin, M. E. and W. W. Reynolds. THERMOREGULATORY BEHAVIOR OF A TROPICAL MARINE FISH: *CANTHIGASTER JACTATOR* (JENKINS). *Hydrobiologia* 70(3):269-279. 2 May 1980. SFA 25(3)
[Mar. Biol. Prog., Univ. New England, Biddeford, ME 04005] *Ten Canthigaster jactator*, tropical marine puffers from Hawaii, were tested individually for 3-day periods in electronic shuttleboxes (Ichthyotrons) to determine their ability to thermoregulate behaviorally. These fish thermoregulated with a degree of precision comparable to that of temperate freshwater fishes: range 23-31°C, S.D. 1.8-2.4°C, S.E. 0.3-0.5°C. The modal final thermal preferendum was 27°C, comparable to temperate warmwater fishes. The mean preferred temperature did not differ significantly between night (26.5°C) and day (26.9°C); the 24-hr mean was 26.7°C. Apparently at least some tropical marine fishes are capable of thermoregulatory behavior similar to that of temperate freshwater fishes.

80-001948 Chervinski, J. NOTE ON THE ADAPTABILITY OF BIG-HEAD (*ARISTICHTHYS NOBILIS*) TO VARIOUS SALINE CONCENTRATIONS. *Bamidgeh* 32(1):27-29. Mar. 1980. SFA 25(3)
[Fish Aquacult. Res. Stn., Dor, Israel] A preliminary investigation was carried out under laboratory conditions in order to determine the feasibility of raising Big-Head (Chinese carp) in brackish water. Big-head (*Aristichthys nobilis*) juveniles of 33-40mm total length were transferred from fresh water to mixed salt and tap water of the following proportions: 15% (S=6%), 20% (S=8%), and 25% (S=10%). All the fish survived a 48 hour stay in 15% and 20% salt water; there was 73% mortality in 25% salt water.

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80-001949 Cook, A. F.; N. E. Stacey and R. E. Peter. PERIOVULATORY CHANGES IN SERUM CORTISOL LEVELS IN THE GOLDFISH, *CARASSIUS AURATUS*. *Gen. Comp. Endocrinol.* 40(4):507-510. Apr. 1980. SFA 25(3)
[Dep. Zool., Biol. Sci. Bldg., Univ. Alberta, Edmonton, AB T6G 2E9, Canada] Sexually mature goldfish maintained under a 16L:8D photoperiod were induced to ovulate by warming from 12 to 21° in the presence of aquatic vegetation. A surge in serum cortisol, measured by radioimmunoassay, occurs at the onset of the dark phase, 4 to 8 hr prior to ovulation. Cortisol may play a physiological role in ovulation in the goldfish.

80-001950 Czeczuga, B. CAROTENOIDS IN FISH. XXIII. SYNGNATHIDAE FAMILY. *Hydrobiologia* 70(3):197-199. 2 May 1980. SFA 25(3)
[Dep. Gen. Biol., Med. Acad., 15-230 Bialystok, Poland]

80-001951 d'Apollonia, S. and P. D. Anderson. OPTIMAL ASSAY CONDITIONS FOR SERUM AND LIVER GLUTAMATE OXALOACETATE TRANSAMINASE, GLUTAMATE PYRUVATE TRANSAMINASE, AND SORBITOL DEHYDROGENASE FROM THE RAINBOW TROUT, *SALMO GAIRDNERI*. *Can. J. Fish. Aquatic Sci.* 37(2):163-169. Feb. 1980. In English with French summ. SFA 25(3)
[Biol. Dep., Concordia Univ., Montreal, PQ, Canada]

80-001952 Daikoku, T. CHANGES IN OSMOTIC AND IONIC CONCENTRATIONS OF VARIOUS TISSUES OF THE GUPPY, *POECILIA RETICULATA*, WITH ADAPTATION TO SEA WATER, AND THE EFFECT OF DIETARY TRIMETHYLAMINE ON THESE CHANGES. *Comp. Biochem. Physiol. A Comp. Physiol.* 66(2):189-195. 1980. SFA 25(3)
[Dep. Biol., Sci. Educ. Inst. Osaka Pref., Osaka 558, Japan]

80-001953 Daikoku, T. EFFECTS OF DIETARY TRIMETHYLAMINE ON THE ALKALINE PHOSPHATASE AND REDUCTASE ACTIVITIES IN THE GUPPY, *POECILIA RETICULATA*, IN RELATION TO SEAWATER ADAPTATION. *Comp. Biochem. Physiol. B Comp. Biochem.* 66(1):99-103. 1980. SFA 25(3)
[Dep. Biol., Sci. Educ. Inst. Osaka Pref., Osaka 558, Japan]

80-001954 Davenport, J. and S. Lönning. OXYGEN UPTAKE IN DEVELOPING EGGS AND LARVAE OF THE COD, *GADUS MORHUA* L. *J. Fish Biol.* 16(3):249-256. Mar. 1980. SFA 25(3)
[N.E.R.C. Unit Mar. Invert. Biol., Mar. Sci. Lab., Menai Bridge, Gwynedd, Wales] Unfertilised cod eggs showed a mean oxygen uptake rate at 5°C of 0.089 µl $O_2$/mg dry wt/h; this gradually rose to 0.768 µl $O_2$/mg dry wt/h in eggs about to hatch. From hatching to complete yolk absorption larvae respired at 1.6µl $O_2$/mg dry wt/h. During starvation following yolk absorption, uptake fell significantly to 1.1 µl $O_2$/mg dry wt./h. Much of this decrease in oxygen consumption was shown to be caused by reduction in activity. Loss of weight during the embryo and larval phases could not easily be reconciled with total oxygen consumption; it is suggested that cod embryos and larvae may not rely solely upon endogenous energy reserves during development.

80-001955 Daxboeck, C. and G. F. Holeton. THE EFFECT OF MS-222 ON THE HYPOXIC RESPONSE OF RAINBOW TROUT (*SALMO GAIRDNERI*). *Comp. Biochem. Physiol. C Comp. Pharmacol.* 65(2):117-121. 1980. SFA 25(3)
[Dep. Zool., Univ. British Columbia, 2075 Wesbrook Mall, Vancouver, BC V6T 1W5, Canada] The response of *S. gairdneri* to environmental hypoxia is biphasic: heart rate and ventilatory rate. Several loci of control for the hypoxic response exist, both centrally and peripherally. MS-222 decreases receptor sensitivity and increases time of response expression in a dose-dependent fashion. Peripheral oxygen receptors are affected most

PHYSIOLOGY (CONTINUED)

80-001955 CONTINUED rapidly and reversibly by MS-222, while other effects are more slowly expressed but less rapidly reversed.

80-001956 Delahunty, G. and V. L. de Vlaming. PHOTOPERIOD-TEMPERATURE INTERACTIONS ON LIVER AND PLASMA METABOLITES IN THE GOLDFISH, *CARASSIUS AURATUS*. *Comp. Biochem. Physiol. A Comp. Physiol.* 66(3):507-512. 1980. SFA 25(3)

[V. L. de Vlaming: Dep. Biol., Marquette Univ., Milwaukee, WI 53233] Plasma and liver metabolites were measured in goldfish after 3 weeks acclimation to one of four different photoperiod-temperature regimes (16L/8D-22°C; 16L/8D-13°C; 8L/16D-22°C; 8L/16D-13°C) during September and April. Samples were taken at the mid-light and mid-dark point of each photoregime. Photoperiod altered levels of plasma protein and plasma cholesterol. Temperature affected the levels of liver glycogen, plasma glucose, organic bound phosphorus and protein. Time of sampling was important in assessing both photoperiod and temperature effects on metabolites. Interaction between photoperiod and temperature was observed in the levels of liver glycogen and plasma glucose. The interaction was dependent on sampling time. Seasonal differences were noted in the day-night variation of specific metabolites and of the photoperiod effects on plasma cholesterol levels.

80-001957 Denis, H.; B. Picard, M. le Maire and J.-C. Clerot. BIOCHEMICAL RESEARCH ON OOGENESIS. THE STORAGE PARTICLES OF THE TELEOST FISH *TINCA TINCA*. *Dev. Biol.* 77(1):218-223. 1 June 1980. SFA 25(3)

[Cent. Genet. Molec. CNRS, F-91190 Gif-sur-Yvette, France]

80-001958 Etessami, S. and I. Pousty. LE PANCRÉAS INTRAHÉPATIQUE CHEZ *SPARUS DATNIA* (HAM. BUCH.), UN SPARIDAE DU GOLFE PERSIQUE. [THE INTRAHEPATIC PANCREAS, IN *SPARUS DATNIA* (HAM. BUCH.), A SPARIDAE FROM THE PERSIAN GULF] *C.R. Seances Soc. Biol. Fil.* 173(5):861-865. 29 Feb. 1979. In French with English summ. SFA 25(3)

[Dep. Ichthyol., Univ. Teheran, B.P. 3262, Teheran, Iran]

80-001959 Farkas, T.; I. Csengeri; F. Majoros and J. Oláh. METABOLISM OF FATTY ACIDS IN FISH. III. COMBINED EFFECT OF ENVIRONMENTAL TEMPERATURE AND DIET ON FORMATION AND DEPOSITION OF FATTY ACIDS IN THE CARP, *CYPRINUS CARPIO* LINNAEUS 1758. *Aquaculture* 20(1):29-40. May 1980. SFA 25(3)

[Inst. Biochem., Biol. Res. Cent. Hungarian Acad. Sci., H-6701 Szeged, Hungary]

80-001960 Farrell, A. P. GILL BLOOD FLOW IN TELEOSTS. *Ph.D. dissertation, Univ. British Columbia* 1979. From Diss. Abstr. Int. B Sci. Eng. 40(11):5167. May 1980. SFA 25(3)

80-001961 Fletcher, G. L. and J. C. Smith. EVIDENCE FOR PERMANENT POPULATION DIFFERENCES IN THE ANNUAL CYCLE OF PASMA "ANTIFREEZE" LEVELS OF WINTER FLOUNDER. *Can. J. Zool.* 58(4):507-512. Apr. 1980. In English with French summ. SFA 25(3)

[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada] Seasonal changes in plasma freezing point depression and $Cl^-$ concentration in a population of Nova Scotian winter flounder were compared with the seasonal changes which occurred in a population of Newfoundland flounder. The plasma protein "antifreeze" component of the freezing point depression was computed by subtracting the freezing point depression due to the concentration of plasma electrolytes from the total plasma freezing point depression. In Nova Scotian flounder the plasma "antifreeze" level increased

PHYSIOLOGY (CONTINUED)

80-001961 CONTINUED approximately 1 month later and declined 2 months earlier than it did in Newfoundland flounder. These differences between the two populations of fish correlated with the regional differences in seawater temperature. When Nova Scotian flounder were transferred to Newfoundland and maintained under Newfoundland conditions of water temperature and photoperiod they retained their plasma "antifreeze" cycle for the duration of the study (approximately 1 year). These results suggest that the timing of the annual plasma "antifreeze" cycle may be a permanent feature of the flounder's physiology and that water temperature does not directly control it. It is hypothesized that some aspects of the annual antifreeze cycle may be endogenous and that if photoperiod plays a role in its regulation the differences between Newfoundland and Nova Scotia are too slight for the cycle to be adjusted in 1 year.

80-001962 Fletcher, P. E. and G. L. Fletcher. ZINC- AND COPPER-BINDING PROTEINS IN THE PLASMA OF WINTER FLOUNDER (*PSEUDOPLEURONECTES AMERICANUS*). *Can. J. Zool.* 58(4):609-613. Apr. 1980. In English with French summ. SFA 25(3)
[Dep. Biol., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

80-001963 Forster, R. P. and J. A. Hannafin. OSMOTIC AND CELL VOLUME REGULATION IN ATRIUM AND VENTRICLE OF THE ELASMOBRANCH SKATE, *RAJA ERINACEA*. *Comp. Biochem. Physiol. A Comp. Physiol.* 65(4):445-451. 1980. SFA 25(3)
[Dep. Biol. Sci., Dartmouth Coll., Hanover, NH 03755]

80-001964 Fouchereau-Peron, M.; M. Laburthe; J. Besson; G. Rosselin and Y. Le Gal. CHARACTERIZATION OF THE VASOACTIVE INTESTINAL POLYPEPTIDE (VIP) IN THE GUT OF FISHES. *Comp. Biochem. Physiol. A Comp. Physiol.* 65(4):489-492. 1980. SFA 25(3)
[Lab. Biol. Mar., Coll. France, F-29110 Concarneau, France]

80-001965 Grün, G. FURTHER EVIDENCE FOR VISUAL CELL INDEPENDENT LIGHT EFFECT ON RETINA DEVELOPMENT IN *TILAPIA LEUCOSTICTA* (TELEOSTEI). *J. Exp. Zool.* 211(3):415-417. Mar. 1980. SFA 25(3)
[Spez. Zool., Ruhr-Univ. Bochum, D 4630 Bochum, West Germany]

80-001966 Gerking, S. D. and R. M. Lee. REPRODUCTIVE PERFORMANCE OF THE DESERT PUPFISH (*CYPRINODON N. NEVADENSIS*) IN RELATION TO SALINITY. *Summ. Proc. Annu. Symp. Desert Fish. Counc.* 10:35. 30 Jan. 1980. Abstract only. SFA 25(3)
[Arizona State Univ., Tempe] The reproductive performance of the desert pupfish, *Cyprinodon n. nevadensis*, was tested for relationship with salinity. Breeding pairs were exposed to a range from nearly 0°/oo to over 40°/oo salinity. In the reproductive parameters utilized; eggs per gram body weight per day, eggs per spawning and the % hatch, the pupfish reproduced best at 10°/oo and gradually below 10°/oo, producing a plateau of statistically equivalent reproduction from .3 to 20°/oo. This species of pupfish exhibited an upper salinity tolerance of 53°/oo and a lower limit of less than 0.1°/oo, in a 96 hour LD-50 test.

80-001967 Greaney, G. S.; A. R. Place; R. E. Cashon; G. Smith and D. A. Powers. TIME COURSE OF CHANGES IN ENZYME ACTIVITIES AND BLOOD RESPIRATORY PROPERTIES OF KILLIFISH DURING LONG-TERM ACCLIMATION TO HYPOXIA. *Physiol.*

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80-001967 CONTINUED *Zool.* 53(2):136-144. Apr. 1980. SFA 25(3)
[Scripps Inst. Oceanogr., Univ. Calif., La Jolla 92093]

80-001968 Grove, D. J. and C. Crawford. CORRELATION BETWEEN DIGESTION RATE AND FEEDING FREQUENCY IN THE STOMACHLESS TELEOST, *BLENNIUS PHOLIS* L. *J. Fish Biol.* 16(3):235-247. Mar. 1980. SFA 25(3)
[U.C.N.W. Mar. Sci. Lab., Menai Bridge, Gwynedd, North Wales] Foregut emptying in *Blennius pholis* at 16-18°C is exponential ($S_t = S_0 e^{-Rt}$; R=0.006 when *t* is in min and *s* in mg dry weight). In consequence, the time for the foregut to empty completely varies in proportion to ln (meal size) in a chosen size of fish or to ln (body weight) in different sized fish fed to the same relative amount (% body weight). Appetite returns rapidly in comparison with other species (4-15 h for fish of 0.5-30 g) and, because of the tidal constraints imposed on this littoral fish, voluntarily ingested meals are large (14-9% body weight depending on fish size). Studies on digestion in small, stomachless fish are not adequately made using X-radiography and must be supported by sequential gut samples after a meal.

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[Lab. Biol. Mar., Fac. Cathol. de Lille, 62164 Ambleteuse, France] In the Perch, the relation between the two variables that are the incubation time (Y) and the temperature (X) cannot be expressed in "degree-days". A regression line is constructed from the logarithmic coordinates and we obtain the relation: $\log Y = -1.72 \log X + \log 1039$ or $YX^{1.72} = 1039$.

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[Ecol. Curric., Univ. N.C., Chapel Hill 27514] Recent food habit and productivity research on the killifish, *Fundulus heteroclitus* (L.), suggests that this species is important in the movement of organic material within and out of the salt marsh ecosystem. The stable carbon isotope ratios of *Fundulus* muscle tissue and gut contents were measured seasonally to determine the carbon sources of the killifish. For muscle $\delta^{13}C$ values ranged from -13.9°/oo to -15.8°/oo and -15.8°/oo to -18.4°/oo for gut contents, suggesting differential assimilation of ingested material. Muscle tissue values indicate that assimilated carbon probably originated from a mixture of benthic algae and *Spartina* ingested by major prey species: the fiddler crab, *Uca pugnax* (Smith); the polychaete, *Nereis (Neanthes) succinea* Frey and Leuckart; the tanaid, *Leptochelia rapax* Harger; and other small crustaceans. Small fish (age 0-1 yr) showed slightly lower $\delta^{13}C$ values than larger fish (age 1-3 yr), consistent with differences in their feeding habits. The only seasonal pattern was an enrichment in tissue $^{13}C$ that occurred for both small and large fish in the spring, corresponding to the peak spawning period. The $\delta^{13}C$ determination is a useful tool in identifying and tracing carbon sources through the salt marsh food web, detecting differences in feeding habits between age classes of organisms, and assessing the relative nutritive value of ingested dietary items if differential assimilation is suspected.

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[I. M. Sechenov Inst. Evol. Physiol. Biochem., USSR Acad. Sci., Leningrad, USSR] Rainbow trout, *Salmo gairdneri*, were kept for 8 hours at a temperature of 10° in fresh water, taken from the Ropsha Ponds, and in distilled water with saline solutions containing the chloride salts of sodium, potassium, calcium and magnesium sulphate in concentrations equal to the amount contained in the water of the Ropsha Ponds. Sodium in particular is taken up from the water, the remaining cations do not influence the sorption of sodium and the zero balance of calcium and sorption of magnesium are noted only when their content in the water is relatively high. The rate at which ions are lost to the water is low in relation to their total content in the trout.

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[Dep. Microbiol., Univ. Aberdeen, Aberdeen, Scotland] The digestive tracts of 138 marine, freshwater and farmed fish representing 42 species were assayed for cellulase activity using viscometry. Activity was exhibited by the majority of fish but the level of activity was variable within and between species and was not located in any particular region of the gut. The majority of omnivorous and piscivorous fish demonstrated nil or slight activity, wheras most 'invertivores' exhibited moderate and high activity levels. This suggests that cellulase activity in fish is the direct result of the ingestion of invertebrates containing cellulase and/or a cellulolytic microflora.

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[Dep. Primary Ind., Fish. Div., Papua, New Guina] A detailed examination of the sexuality of *L. calcarifer* led to the conclusion that it was a protandrous hermaphrodite. The smaller length classes are almost exclusively male, the percentage of females increasing with increased total length. Length frequencies, calculated from the dissection of 5202 mature specimens, give a male mode at 89.5 cm and a much smaller female one at 101.5 cm. The overall sex ratio is 3.8:1 in favour of males. There is a small proportion of primary females and also the possiblity that some males do not undergo the change to female. Biopsy experiments were used to confirm protandric sex inversion. As the gonads of *L. calcarifer* are strongly dimorphic, inversion of sex requires a complete reorganization of gonad structure as well as function. Few hermaphrodite gonads were detected, this being attributed to a rapid transition phase from male to female and the lack of sampling during the period when transitions are most likely to occur.

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[Fac. Fish., Hokkaido Univ., Hakodate, Hokkaido, 041, Japan] The source of calcium for scale regeneration was studied in the descaled goldfish, *Carassius auratus*. $^{45}Ca$-prelabeled fish showed no stimulated rate of calcium resorption from the remaining scales, vertebrae and ribs during scale regeneration. The calcium content of the tissues also remained unchanged. Environmental $^{45}Ca$ was heavily incorporated into regenerating scales and the rate of incorporation was highest in the second week following scale removal. The results indicate that exogenous calcium, rather than endogenous, is primarily utilized for scale regeneration of goldfish.

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[Inst. Physiol., Siberian Dep., Acad. Med. Sci., Novosibirsk, USSR] The dynamics of the electromyographic activity (EA) of motor (red, white) and respiratory muscles was studied, along with changes in the temperature of the red muscles of the Baikal grayling, *Thymallus arcticus baicalensis*, during swimming at a speed of 2.5 L/sec. Electrical activity and changes in the temperature of the muscles studied are higher by 30-120% in the first minutes of swimming relative to the stable values of these indicators characteristic of further swimming at this speed. This nature of the changes of the indicators is a reflection of the heightened functional activity of the motor and respiratory muscles in the first minutes of swimming of the Baikal grayling.

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[Dep. Biol., Marquette Univ., Milwaukee, WI 53233]

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[U.S. EPA, 6201 Congdon Blvd., Duluth, MN 55804] Acetylcholinesterase (AChE) preparations from the muscle of the fathead minnow (*Pimephales promelas* Rafinesque) were treated (*in vitro*) with 74 chemicals of various classes, many of which are environmental contaminants, to determine their effect upon enzyme activity. A highly inhibitory effect was found with several carbamates, one organo-oxy-phosphate, the arsenite ion, and certain heavy metal cations. Intermediate inhibition was found with the arsenate ion, other metal cations, organometals, certain neuroactive agents, organophosphates, and one organochloride pesticide. Several organochloride pesticides, alkaline and alkaline-earth cations, a variety of anions, several drugs, and other chemicals had little inhibitory effect at the highest concentration used (0.01 M). The effect of chemicals in mixtures of known composition was approximately additive. None of the chemicals tested caused detectable enzyme activation.

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[Dep. Appl. Hydrobiol., Agric. Univ. Coll. Athens, Iera Odos 75, Votanikos, Athens, Greece]

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[Dep. Physiol. Biophys., Univ. Ill., Urbana 61801]

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[Biol. Dep., Univ. N. Dak., Grand Forks 58202]

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[Sch. Environ. Life Sci., Murdock Univ., Murdoch, West. Australia 6153, Australia]

80-002015 Priede, I. G. and F. G. T. Holliday. THE USE OF A NEW TILTING TUNNEL RESPIROMETER TO INVESTIGATE SOME ASPECTS OF METABOLISM AND SWIMMING ACTIVITY OF THE PLAICE (*PLEURONECTES PLATESSA* L.). *J. Exp. Biol.* 85:295-309. Apr. 1980. SFA 25(3)
[Dep. Zool., Univ. Aberdeen, Scotland] Plaice and other flatfish can be induced to swim down a slope of about 60°C against an upwelling water flow in a water tunnel. A tilting Brett-type tunnel respirometer based on the above principle enabled laboratory experiments on swimming plaice to be carried out. From trials at 5°, 10°C, 15°C, the relationship between specific swimming speed, V (body lengths/s), oxygen consumption, R (l/mg·l/kg/h) and temperature, T is: $\log_{10}$ = 0.3318V + + $\log_{10}$(2.45T + 26.52). If the fish is resting (i.e. V = o), the oxygen consumption is lower than predicted by the above equation. At rest: R = 2.14T + 2.66. The cost of swimming in plaice is very similar to that of typical round fish such as haddock but the resting metabolic

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80-002015 CONTINUED rate is lower than for haddock. Before swimming, a negatively buoyant fish such as plaice must lift off the bottom. This cost of lift-off or posture effect makes it uneconomical for plaice to swim at speeds below 0.6V.

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[Dep. Zool., Hebrew Univ. Jerusalem, Jerusalem, Israel] The ichthyotoxic mechanism of the Red Sea flatfish *Pardachirus marmoratus* crude secretion (PMC) and its derived toxin pardaxin was investigated using in vivo lethality tests and in vitro gill preparations of fish preadapted to different salinities. Comparative studies with ouabain and cytotoxin (a factor derived from cobra snake venom) were performed and it has been found that: 1) The lethal potencies of PMC increased in fish adapted to salinities above and below the isotonic level. 2) In contrast to PMC and pardaxin the lethal effects of ouabain and cytotoxin were weak upon external application and potent by injection. 3) When compared to ouabain, pardaxin was found to be about three and five orders of magnitude more potent gill ATPase inhibitor in fish and crustacean preparations, respectively. 4) EM studies of gills obtained from fish treated by sublethal doses of PMC revealed the appearance of apical crypts in gill chloride cells.

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[Lab. Pharmacol., Natl. Inst. Environ. Health Sci., P.O. Box 12233, Research Triangle Park, NC 27709]

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[Int. Cent. Living Aquatic Resour. Manage., MCC P.O. Box 1501, Makati, Metro Manila, Philippines]

80-002019 Rahmann, H. and R. Hilbig. BRAIN GANGLIOSIDES ARE INVOLVED IN THE ADAPTATION OF ANTARCTIC FISH TO EXTREME LOW TEMPERATURES. *Naturwissenschaften* 67(5):259-260. May 1980. SFA 25(3)

[Inst. Zool. Univ., D-7000, Stuttgart, West Germany]

80-002020 Rubec, P. J. EFFECT OF PHEROMONES ON BEHAVIOR OF ICTALURID CATFISH. *Ph.D. dissertation, Tex. A&M Univ.* 178p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(12, part 1):5575. June 1980. SFA 25(3)

The behavioral responses of channel catfish (*Ictalurus punctatus*) and black (*I. melas*), brown (*I. nebulosus*) and yellow bullhead (*I. natalis*) to pheromones were monitored. Channel catfish were significantly attracted to the water-borne odor of an immature female conspecific and exhibited a significant interaction between the donor's odor, sex of test fish and water flow. The odor was also efficiently localized without a differential in water flow by both channel catfish and brown bullhead. The above species were significantly attracted to their own substrate marks. The attraction of channel catfish to PVC tubes within species indicated preferences for their own residence tubes, plus attraction to the tube of a conspecific. Male channel catfish, following exposure to conspecifics, recognized and avoided their substrate marks on tubes. Channel catfish

PHYSIOLOGY (CONTINUED)

80-002020 CONTINUED exhibited a greater attraction to tubes of black bullheads than to the respective tubes of yellow and brown bullheads. Sexually mature black bullheads showed a strong attraction to the tubes of sexually mature conspecifics over those of immature fish of either sex. These data indicate recognition of different substrate marks according to sex, species and state of sexual maturity of the donors. The chemical cues may allow home site recognition and territorial marking. Mature female black and brown bullheads distinguished and were attracted to urine from conspecifics of the opposite sex. They also preferred the urine of their own species. Urine responses varied from strong attraction to avoidance depending on the physiological state of the donors. Skin, axillary gland and seminal vesicles were found to be anatomical sources of pheromones. The responses of individual test fish to extracts of these tissues varied. Extracts of skin and axillary glands caused avoidance and attraction-avoidance responses at high and low concentration. Dilution of samples indicated the behavior of test fish shifted from avoidance to attraction at an optimal concentration. There was also evidence of a concentration dependence with urine samples. Seminal vesicle solutions were highly attractive. The consecutive testing of different tissue extracts, or dilutions of the same solution, allowed the assessment of behavioral changes with the same test fish. The bioassay of urine extracts indicated the presence of both lipoidal and non-lipoidal pheromones in urine. The latter appeared to be proteinaceous. Male donors, while being injected with human chorionic gonadotropin, appeared to produce one or the other of these pheromones. This indicates the influence of hormones on pheromone production.

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[Lab. Microbiol., Fac. Fish., Kagoshima Univ., Kagoshima 890, Japan]

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[Death Valley Natl. Monument, Death Valley, CA]

80-002023 Shuttleworth, T. J. and J. L. Thompson. OXYGEN CONSUMPTION IN THE RECTAL GLAND OF THE DOGFISH *SCYLIORHINUS CANICULA* AND THE EFFECTS OF CYCLIC AMP. *J. Comp. Physiol. B Biochem. Syst. Environ. Physiol.* 136(1):39-43. Mar. 1980. SFA 25(3)
[Dep. Biol. Sci., Univ. Exeter, Exeter EX4 4PS, England]

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[Dep. Zool., Univ. Zululand, Private Bag, Kwa-Dlangezwa 3886, South Africa]

80-002025 Smith, M. J. and A. G. Heath. RESPONSES TO ACUTE ANOXIA AND PROLONGED HYPOXIA BY RAINBOW TROUT (*SALMO GAIRDNERI*) AND MIRROR CARP (*CYPRINUS CARPIO*) RED AND WHITE MUSCLE: USE OF CONVENTIONAL AND MODIFIED METABOLIC PATHWAYS. *Comp. Biochem. Physiol. B Comp. Biochem.* 66(2):267-272. 1980. SFA 25(3)
[Dep. Biol., Millsaps Coll., Jackson, MS 39210]

80-002026 Soivio, A.; M. Nikinmaa and K. Westman. THE BLOOD OXYGEN BINDING PROPERTIES OF HYPOXIC *SALMO GAIRDNERI*. *J. Comp. Physiol. B Biochem. Syst. Environ. Physiol.* 136(1):83-87. Mar. 1980. SFA 25(3)

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80-002026 CONTINUED
[Div. Physiol., Dep. Zool., Univ. Helsinki, Arkadiankatu 7, SF-00100 Helsinki 10, Finland]

80-002027 Strange, R. J. and C. B. Schreck. SEAWATER AND CONFINEMENT ALTERS SURVIVAL AND CORTISOL CONCENTRATION IN JUVENILE CHINOOK SALMON. *Copeia* 1980(2):351-353. 1 May 1980. SFA 25(3)
[Dep. For. Wildl. Fish., Univ. Tenn., P.O. Box 1071, Knoxville 37901]

80-002028 Stuenkel, E. L. and S. D. Hillyard. EFFECTOS DE LA TEMPERATURA Y SALINIDAD EN EL METABOLISM ENERGETICO Y ELECTROLYTICO DEL PUPFISH, *CYPRINODON SALINUS*. [EFFECTS OF TEMPERATURE AND SALINITY ON ELECTROLYTE AND ENERGY METABOLISM IN THE PUPFISH, *CYPRINODON SALINUS*.] *Summ. Proc. Annu. Symp. Desert Fish. Counc.* 10:49. 30 Jan. 1980. In English and Spanish. Abstract only. SFA 25(3)
[Univ. Nev., Las Vegas] Salt Creek pupfish, *Cyprinodon salinus*, were acclimated to freshwater (FW) and to concentrations of Salt Creek water which approximated 1/2 sea water (1/2 SW; 641 mosm/kg) and sea water (SW; 1,168 mosm/kg) at three acclimation temperatures 15, 25 and 30 C. Standard metabolic rate ($VO_2$) was found to increase significantly with increasing acclimation salinity although in SW, the $VO_2$ of 25 and 30 C acclimated fish was not different. The specific activity of gill $Na^+ - K^+$ ATPase was lowest in 1/2 SW acclimated fish at each acclimation temperature and increased two-fold with acclimation to FW or SW. The acclimation temperature also influenced gill $Na^+ - K^+$ ATPase activity with higher activity values observed in the 15° than in the 30° acclimation groups in FW and 1/2 SW. Plasma osmolality was not significantly affected by acclimation temperature in the 1/2 SW acclimated fish. In FW and SW, however, plasma osmolality decreased or increased, respectively as the acclimation temperature decreased below 30°. *C. salinus*, thus, appears to tolerate elevated salinity better at higher temperatures which correlates with the field observations that environmental salinities in Salt Creek are highest during the hot summer months.

80-002029 Tandon, R. S. and S. Chandra. ECOPHYSIOLOGY OF FISHES; EFFECT OF STARVATION ON SERUM ALKALINE PHOSPHATASE LEVELS OF FRESHWATER CATFISH *CLARIAS BATRACHUS*. *Brotéria* 48(1-4):35-38. 1979. SFA 25(3)
[Dep. Zool., Lucknow Univ., Lucknow-226007, India]

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[Inst. Biol. Med. Exp., Lab. Esteroides, Obligado 2490, Buenos Aires 1428, Argentina]

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[Ichthyological Assoc., Inc., 100 Smith Cass St., Middletown, DE 19709]

80-002032 Ueda, H. and H. Takahashi. RESPONSES OF TWO DIFFERENT TYPES OF PITUITARY GONADOTROPHS OF THE LOACH, *MISGURNUS ANGUILLICAUDATUS*, TO GONADECTOMY AND TO EXOGENOUS SEX STEROIDS. *Gen. Comp. Endocrinol.* 40(4):463-472. Apr. 1980. SFA 25(3)
[Dep. Biol., Fac. Fish., Hokkaido Univ., Minato-cho 3-1-1, Hokadate 041, Japan]

PHYSIOLOGY (CONTINUED)

80-002033 Ueda, H. CHANGES OF TWO TYPES OF PITUITARY GONADOTROPHS IN WHITESPOTTED CHAR, *SALVELINUS LEUCOMAENIS*, DURING GONADAL DEVELOPMENT. *Bull. Fac. Fish. Hokkaido Univ.* 31(1):1-15. Mar. 1980. SFA 25(3)
[Lab. Fresh-Water Fish-Cult., Fac. Fish., Hokkaido Univ., Minato-cho, Hokodate 041, Japan] In the proximal pars distalis of the pituitary gland of male and female whitespotted char, *Salvelinus leucomaenis*, two distinct types of glandular cells, termed the globular and vesicular cells, were discerned from possible thyrotrophs and somatotrophs by their locality, staining property and ultrastructure. Changes of the two types of cells were examined light and electron microscopically during the course of the first maturation and spawning of the fish. A few globular cells with immature cytoplasmic granules were already in existence in the pituitaries of one-year old fish with ovaries at the early yolk vesicle stage or with testes at the spermatogonial stage. In harmony with the subsequent development of the gonads, the globular cells showed a notable increase both in number and in size, and displayed a degranulation and a dilation of endoplasmic reticulum, followed by some atrophic changes, at the time of spawning. By contrast, the vesicular cells, which were absent in the pituitaries of immature one-year old fish, made their appearance concurrently with the appearance of oocytes in the late yolk vesicle stage or of the first spermatocytes in the gonads. They showed little change during the period of advancing vitellogenesis and spermatogenesis, but became activated again, with the development of the Golgi apparatus and the accumulation of cytoplasmic granules, 3 months after spawning when ovarian oocytes were at the late yolk vesicle stage. It was concluded that the two types of pituitary cells in the char were gonadotropic in function, each acting in different phases of gonadal development. Possible significance of the vesicular cells was discussed with respect to their implication in the initiation of vitellogenesis and spermatogenesis.

80-002034 van den Thillart, G.; F. Kesbeke and A. van Waarde. ANAEROBIC ENERGY-METABOLISM OF GOLDFISH, *CARASSIUS AURATUS* (L.). INFLUENCE OF HYPOXIA AND ANOXIA ON PHOSPHORYLATED COMPOUNDS AND GLYCOGEN. *J. Comp. Physiol. B Biochem. Syst. Environ. Physiol.* 136(1):45-52. Mar. 1980. SFA 25(3)
[Zool. Lab., Dep. Anim. Physiol., State Univ. Leiden, Kaiserstr. 63, Leiden, The Netherlands]

80-002035 van Eys, G. J. J. M. STRUCTURAL CHANGES IN THE PARS INTERMEDIA OF THE CICHLID TELEOST *SAROTHERODON MOSSAMBICUS* AS A RESULT OF BACKGRWOUND ADAPTATION AND ILLUMINATION. I. THE MSH-PRODUCING CELLS. *Cell Tissue Res.* 208(1):99-110. 1980. SFA 25(3)
[Dep. Zool., Univ. Nijmegen, Nijmegen, The Netherlands]

80-002036 Voss, E. W., Jr.; W. J. Groberg, Jr. and J. L. Fryer. METABOLISM OF COHO SALMON Ig. CATABOLIC RATE OF COHO SALMON TETRAMERIC Ig IN SERUM. *Mol. Immunol.* 17. 445-452. 1980. SFA 25(3)
[Dep. Microbiol., Univ. Ill., Urbana 61801]

80-002037 Wahlqvist, I. and S. Nilsson. ADRENERGIC CONTROL OF THE CARDIO-VASCULAR SYSTEM OF THE ATLANTIC COD, *GADUS MORHUA*, DURING "STRESS". *J. Comp. Physiol. B Biochem. Syst. Environ. Physiol.* 137(2):145-150. May 1980. SFA 25(3)
Dep. Zoophysiol., Univ. Göteborg, Fack, S-400 33 Göteborg, Sweden]

80-002038 Walesby, N. J. and I. A. Johnston. FIBRE TYPES IN THE LOCOMOTORY MUSCLES OF AN ANTARCTIC TELEOST, *NOTOTHENIA ROSSII*. *Cell Tissue Res.* 208(1):143-164. 1980. SFA 25(3)

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80-002038 CONTINUED
[I.A. Johnston: Dep. Physiol., Bute Med. Bldg., St. Andrews Univ., St. Andrews, Fife KY16 9TS, Scotland]

80-002039 Ware, D. M. BIOENERGETICS OF STOCK AND RECRUITMENT. *Can. J. Fish. Aquatic Sci.* 37(6):1012-1024. June 1980. In English with French summ. SFA 25(3)
[Bedford Inst. Oceanogr., P.O. Box 1006, Dartmouth, NS B2Y 4A2, Canada]

80-002040 Wendelaar Bonga, S. E. and J. C. A. van der Meij. THE EFFECT OF AMBIENT CALCIUM ON PROLACTIN CELL ACTIVITY AND PLASMA ELECTROLYTES IN *SAROTHERODON MOSSAMBICUS (TILAPIA MOSSAMBICA). Gen. Comp. Endocrinol.* 40(4):391-401. Apr. 1980. SFA 25(3)
[Dep. Zool., Univ. Nijmegen, Nijmegen, The Netherlands]

80-002041 Wiegand, M. D. and R. E. Peter. EFFECTS OF SALMON GONADOTROPHIN (SG-G100) ON PLASMA LIPIDS IN THE GOLDFISH, *CARASSIUS AURATUS. Can. J. Zool.* 58(6):957-966. June 1980. In English with French summ. SFA 25(3)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

80-002042 Wiegand, M. D. and R. E. Peter. EFFECTS OF TESTOSTERONE, OESTRADIOL-17β AND FASTING ON PLASMA FREE FATTY ACIDS IN THE GOLDFISH, *CARASSIUS AURATUS. Comp. Biochem. Physiol. A Comp. Physiol.* 66(2):323-326. 1980. SFA 25(3)
[R.E. Peter: Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

80-002043 Wiegand, M. D. and R. E. Peter. EFFECTS OF SEX STEROIDS ON PLASMA LIPIDS IN THE GOLDFISH, *CARASSIUS AURATUS. Can. J. Zool.* 58(6):967-972. June 1980. In English with French summ. SFA 25(3)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

80-002044 Wittenberg, J. B.; D. E. Copeland; R. L. Haedrich and J. S. Child. THE SWIMBLADDER OF DEEP-SEA FISH: THE SWIMBLADDER WALL IS A LIPID-RICH BARRIER TO OXYGEN DIFFUSION. *J. Mar. Biol. Assoc. U.K.* 60(2):263-276. May 1980. SFA 25(3)
[Dep. Physiol., Albert Einstein Coll. Med., New York, NY 10461]

80-002045 Yoshii, K.; M. Kashiwayanagi; K. Kurihara and Y. Kobatake. HIGH SENSITIVITY OF THE EEL PALATINE RECEPTORS TO CARBON DIOXIDE. *Comp. Biochem. Physiol. A Comp. Physiol.* 66(2):327-330. 1980. SFA 25(3)
[K. Kurihara: Fac. Pharm. Sci., Hokkaido Univ., Sapporo, Japan]

80-002046 Zimmerer, E. J. ENVIRONMENTAL EFFECTS ON GROWTH AND FIN REGENERATION IN POECILIID FISHES. *Ph.D. dissertation, Rutger's Univ. State Univ. N.J.* 137p. 1980. From Diss. Abstr. Int. B Sci. Eng. 40(11):5173. May 1980. SFA 25(3)
Temperature, salinity, pH, food level, photoperiod, and factors associated with stunting in fishes were tested for their effect on general body growth

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80-002046 CONTINUED and fin regeneration in the poeciliid minnows, *Poecilia latipinna*, *P. reticulata*, and *Gambusia affinis*. In terms of general body growth, fish grew faster at an optimal temperature and had reduced growth rates above and below this point. However, regenerate growth responded to temperature in a different way, with maximum growth at the highest temperatures tolerated, and growth rate dropping with decreased temperature. Experiments testing the growth responses of these fish to fresh (.02 °/oo) versus brackish (8 °/oo) water showed *P. latipinna* to grow best in brackish water, *G. affinis* to grow best in fresh water, and *P. reticulata* to grow equally well in both conditions. *P. latipinna* and *G. affinis* showed parallel regeneration responses to these conditions, however, *P. reticulata* regenerated faster in fresh water. Food level has a direct effect on body growth of all fishes. At ration levels above maintenance fish will grow faster until maximum growth rates are achieved. Fin regeneration in *P. latipinna* and *P. reticulata* was shown to be unaffected by various ration levels above maintenance. Only at ration levels far below maintenance (starvation and prolonged near starvation) was a reduction in fin regeneration observed. *P. latipinna* responsed to increased densities with decreased body growth. Existing literature shows *P. reticulata* to respond in a similar manner. The literature also shows *P. reticulata* to grow faster with a decrease in fish number. Experiments here have shown *P. latipinna* to exhibit no differential body growth response to group size. Experiments designed to demonstrate the effect of crowding and group size as well as increased waste products in the water, the presence of larger conspecifics, and the presence of other fish species on regeneration showed no differential responses to these conditions. The photoperiods tested (24 hours light, 12 hours light/12 hours dark, and 1 hour light/23 hours dark) and pH's maintained at 8-8.5 (by NaOH, KOH, and $Ca(OH)_2$) neutral, or 5.5-6 (by peat extract) resulted in no differential response of general body growth or fin regeneration. Statistical analysis (Analysis of Covariance) has shown that the aspect of fin regeneration affected most consistently was the time necessary for wound healing and blastema formation, as represented by the Y-intercept of a linear plot of growth versus time. This aspect of fin regeneration was affected in all cases where an overall differential regeneration response was noted. The slope of the growth versus time plot represents the fin tissue growth rate after initial blastema formation. This aspect of fin regeneration was affected consistently only at the lower temperatures tested and under starvation conditions. The failure of this second aspect of fin regeneration to respond to the middle and higher temperatures indicates the possible presence of some biochemical or physiological limiting factor. This study demonstrates that fin regeneration, for the most part, responds to these environmental factors in a different way than general body growth. Therefore, when used as a short term bio-assay procedure, these differences must be taken into consideration.

GENETICS, VARIATION STUDIES AND HYBRIDIZATION

80-002047 Braman, J. C.; C. B. Stalnaker; G. T. Klar and T. M. Farley. HEMOGLOBIN POLYMORPHISM IN ADULT CUTTHROAT TROUT, *SALMO CLARKII*. *J. Exp. Zool.* 211(3):411-413. Mar. 1980. SFA 25(3)

[Utah Coop. Fish. Res. Unit, Utah State Univ., Logan 84322] Hemoglobin polymorphism was detected in a population of adult cutthroat trout by employing starch gel electrophoresis. Variation occurred only in the cathodally migrating hemoglobins. Six electrophoretic patterns were assumed to be present; however, the existence of a greater degree of complexity has not been ruled out. Eight of the 93 adult cutthroat trout sampled displayed a hemoglobin electrophoretic pattern identical to that obtained from adult rainbow trout.

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

80-002048 Busack, C. A. and G. H. Thorgaard. KARYOTYPE OF THE SACRAMENTO PERCH, *ARCHOPLITES INTERRUPTUS*. *Calif. Fish Game* 66(3):189-191. July 1980. SFA 25(3)
[Dep. Anim. Sci., Univ. Calif., Davis 95616]

80-002049 Buth, D. G. EVOLUTIONARY GENETICS AND SYSTEMATIC RELATIONSHIPS IN THE CATOSTOMID GENUS *HYPENTELIUM*. *Copeia* 1980(2):280-290. 1 May 1980. SFA 25(3)
[Dep. Biol., Univ. Calif., Los Angeles 90024] Two or more population samples of each of the three recognized species of the tetraploid catostomid genus *Hypentelium* were subjected to electrophoretic analyses to detect isozyme variability resolving a total of 60 alleles encoded by 40 presumptive loci. Species of *Hypentelium* express only about one-third of their loci in duplicate suggesting a high level of evolutionary advancement within the Catostomidae. *Hypentelium roanokense* expresses the Ak-A and Gpi-B loci in duplicate, whereas these loci are functionally diploid in *H. etowanum* and *H. nigricans*. *Hypentelium etowanum* and *H. nigricans* are phenetically close compared to *H. roanokense*. A cladistic analysis of the genetic data reveals that *H. roanokense* exhibits numerous apomorphic allelic characteristics while *H. etowanum* and *H. nigricans* are phenetically close due to a high degree of allelic symplesiomorphy. A biochemical key to the species of the genus *Hypentelium* is provided.

80-002050 Gervai, J.; T. Marián; Z. Krasznai; A. Nagy and V. Csányi. OCCURRENCE OF ANEUPLOIDY IN RADIATION GYNOGENESIS OF CARP, *CYPRINUS CARPIO* L. *J. Fish Biol.* 16(4):435-439. Apr. 1980. SFA 25(3)
[Lab. Behav. Genet., Eötvös Univ., 2131 Göd Jävorka, S. u. 14, Hungary] DNA content and chromosome numbers were studied in gynogenetic and normal carp embryos. Gynogenetic embryos showed the haploid chromosome number, the occurrence of spontaneous diploidization was rare. Early cold shock treatment of the gynogenetic zygotes resulted in the retention of the second polar body producing a much higher proportion of normally developing viable larvae. The appearance of large numbers of aneuploid embryos in the cold-treated gynogenetic group is explained by the loss or breakdown of chromosomes that are caused in their turn by the absorbtion of the second polar body through the cold treatment.

80-002051 Hulata, G.; R. Moav and G. Wohlfarth. GENETIC DIFFERENCES BETWEEN THE CHINESE AND THE EUROPEAN RACES OF THE COMMON CARP III. GONAD ABNORMALITIES IN HYBRIDS. *J. Fish Biol.* 16(4):369-370. Apr. 1980. SFA 25(3)
[Agric. Res. Organ., Inst. Anim. Sci., Fish Aquacult. Res. Stn., Dor, Israel]

80-002052 Imhof, M.; R. Leary and H. E. Booke. POPULATION OR STOCK STRUCTURE OF LAKE WHITEFISH, *COREGONUS CLUPEAFORMIS*, IN NORTHERN LAKE MICHIGAN AS ASSESSED BY ISOZYME ELECTROPHORESIS. *Can. J. Fish. Aquatic Sci.* 37(5):783-793. May 1980. In English with French summ. SFA 25(3)
[Lab. Limnol., Univ. Wis., Madison 53706]

80-002053 Jamieson, A. and R. J. Turner. MUSCLE PROTEIN DIFFERENCES IN TWO EELS *ANGUILLA ANGUILLA* (LINNAEUS) AND *ANGUILLA ROSTRATA* (LE SEUER). *Biol. J. Linn. Soc.* 13(1):41-45. Feb. 1980. SFA 25(3)
[Minist. Agric. Fish. Food, Fish. Lab., Lowestoft, Suffolk, NR33 0HT, England]

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

80-002054 LeGrande, W. H. and T. M. Cavender. THE CHROMOSOME COMPLEMENT OF THE STONECAT MADTOM, *NOTURUS FLAVUS* (SILURIFORMES: ICTALURIDAE), WITH EVIDENCE FOR THE EXISTENCE OF A POSSIBLE CHROMOSOMAL RACE. *Copeia* 1980(2):341-344. 1 May 1980. SFA 25(3)
[Dep. Biol., Univ. Wis., Stevens Point 54481]

80-002055 Loudenslager, E. J. and G. A. E. Gall. GEOGRAPHIC PATTERNS OF PROTEIN VARIATION AND SUBSPECIATION IN CUTTHROAT TROUT, *SALMO CLARKI*. *Syst. Zool.* 29(1):27-42. Mar. 1980. SFA 25(3)
[Dep. Anim. Sci., Univ. Calif., Davis 95616] Genetic differentiation and the evolutionary relationships among 30 populations, representing five subspecies of inland cutthroat trout, *Salmo clarki* (Richardson), were studied by examining geographic variation at 35 genetic loci assayed with starch gel electrophoresis. Analysis of population subdivision using Nei's $H_T$, $H_S$, and $G_{ST}$ statistics, indicated low genetic variability within, and extreme genetic subdivision among subspecies inhabiting independent basins and drainages. Substantial subdivision was also observed for isolated populations within the Lahontan Basin. UPGMA and Wagner clustering analysis indicated that inland *S. clarki* can be subdivided into three major groups: 1) *S. c. utah*, *S. c. pleuriticus*, and *S. c. bouvieri* constitute a subspecies complex that inhabits drainages of the Bonneville Basin, Colorado River, Upper Snake River, and the Yellowstone River; 2) *S. c. henshawi*, a subspecies inhabiting the Lahontan Basin; and 3) *S. c. lewisi*, a widely dispersed group inhabiting the Upper Columbia and Upper Missouri River drainages. *Salmo c. henshawi* is closely related to the *utah-pleuriticus-bouvieri* complex whereas *lewisi* is electrophoretically distinct and not closely related to the other four inland subspecies. These results are concordant with chromosomal analysis and topographical changes in Western North America.

80-002056 Murofushi, M.; S. Oikawa; S. Nishikawa and T. H. Yosida. CYTOGENETICAL STUDIES ON FISHES, III. MULTIPLE SEX CHROMOSOME MECHANISM IN THE FILEFISH, *STEPHANOLEPIS CIRRHIFER*. *Jpn. J. Genet.* 55(2):127-132. Apr. 1980. SFA 25(3)
[Lab. Biol., Fac. Mishima Junior Coll., Nihon Univ., Mishima 411, Japan]

80-002057 NUCLEAR TRANSPLANTATION IN TELEOSTS. I. HYBRID FISH FROM THE NUCLEUS OF CARP AND THE CYTOPLASM OF CRUCIAN. *Sci. Sin.* 23(4):517-525. Apr. 1980. SFA 25(3)
Hybrid fish are obtained from the combination of nucleus and cytoplasm from different genera of fresh-water teleosts using the technique of nuclear transplantation, i.e. by combining nucleus of the carp (*Cyprinus carpio*) and cytoplasm of the crucian (*Carassius auratus*). Morphological characteristics of these hybrid fish show that some features are inherited from the nucleus doner fish such as barbs and pharyngeal teeth, some seem to come from the cytoplasm host fish such as the number of vertebrae, and some are intermediates such as the number of scales along the lateral line. These results indicate that both nucleus and cytoplasm can influence the expression of genetic information on the hybrid fish. Some of the hybrid fish are sexually mature and can produce normal offspring by artificial insemination.

80-002058 Schultz, R. J. ROLE OF POLYPLOIDY IN THE EVOLUTION OF FISHES. IN W. H. Lewis, ed. *Polyploidy: Biological Relevance*. Plenum Publ. Corp., New York, NY. p. 313-340. 1980. SFA 25(3)
[Ecol. Sect., Biol. Sci. Group, Univ. Conn., Storrs 06268]

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

80-002059 Smith, P. J.; G. J. Patchell and P. G. Benson. GLUCOSEPHOSPHATE ISOMERASE AND ISOCITRATE DEHYDROGENASE POLYMORPHISMS IN THE HAKE, *MERLUCCIUS AUSTRALIS*. *N.Z. J. Mar. Freshwater Res.* 13(4):545-547. 1979. SFA 25(3)

[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 19062, Wellington, New Zealand] As part of a stock separation programme on the hake, *Merluccius australis* (Hutton), two polymorphic proteins--glucosephosphate isomerase and isocitrate dehydrogenase--were examined in four samples of fish from around the South Island of New Zealand and the waters to the south. No significant differences in allele frequencies were found between the four areas, and with evidence from biological data it appears that there is one major stock of *M. australis* around New Zealand.

BEHAVIOR

80-002060 Døving, K. B.; R. Selset and G. Thommesen. OLFACTORY SENSITIVITY TO BILE ACIDS IN SALMONID FISHES. *Acta Physiol. Scand.* 108(2):123-131. Feb. 1980. SFA 25(3)

[Inst. Zoophysiol., Univ. Oslo, Norway] Monopolar DC-recordings were made simultaneously from two positions on the olfactory bulb of chars (*Salmo alpinus* L.) and graylings (*Thymallus thymallus* L.) using bile acids and amino acids as olfactory stimulants. The bile acids induced responses with characteritic spatial differences from those of the amino acids. The distribution of responses to bile acids indicated a neuronal activity in the medial part of the bulb. In contrast, amino acids elicit responses in the lateral part of the bulb. Taurine conjugated bile acids were up to 1,000 times more potent as olfactory stimuli than methionine. The results suggest that olfactory receptors are of two types, one responding to bile acids, the other to amino acids. 3-α-hydroxysteroids are released from the fish into the water in quantities that suffice for detection by their olfactory system. The odorant potency of the bile acids, their evolutionary history and variability, together with their renowned adherent properties made them interesting candidates for specific signals in the aquatic environment.

80-002061 Baker, C. L., Jr. JAMMING AVOIDANCE BEHAVIOR IN GYMNOTOID ELECTRIC FISH WITH PULSE-TYPE DISCHARGES: SENSORY ENCODING FOR A TEMPORAL PATTERN DISCRIMINATION. *J. Comp. Physiol. A Sens. Neural Behav. Physiol.* 136(2):165-181. Mar. 1980. SFA 25(3)

[Dep. Neurosci., A-002 U.S.S.D., La Jolla, CA 92093]

80-002062 Bechler, D. L. THE EVOLUTION OF AGONISTIC BEHAVIOR IN AMBLYOPSID FISHES. *Trans. Mo. Acad. Sci.* 13:177. 1979. Abstract only. SFA 25(3)

[Dep. Biol., St. Louis Univ., St. Louis, MO 63103]

80-002063 Beecher, H. A. HABITAT SEGREGATION OF FLORIDA CARPSUCKERS (OSTEICHTHYES: CATOSTOMIDAE: *CARPIODES*). *Fla. Sci.* 43(2):92-97. 1980. SFA 25(3)

[Wash. Nat. Heritage Prog., Nature Conservancy, Bldg. 17, Air-Industrial Cent., Olympia, WA 98504] *Carpiodes cyprinus* and *C. velifer* were captured with a boat-mounted electrofishing apparatus in various habitats in the Escambia and Choctawhatchee rivers, and *C. cyprinus* was similarly captured in the Apalachicola River. There was much overlap in habitat, but in the Escambia River *C. cyprinus* occurred in mid-river more than would have been expected had the 2 species of carpsuckers been similarly distributed. *Carpiodes cyprinus* was concentrated in mid-river in late summer and early fall during low water in all 3 rivers, and during high

BEHAVIOR (CONTINUED)

80-002063 CONTINUED water *C. cyprinus* occupied areas of reduced current. On the other hand, *C. velifer* occupied areas of reduced current in the Escambia and Choctawhatchee rivers throughout the year.

80-002064 Blake, R. W. THE MECHANICS OF LABRIFORM LOCOMOTION. II. ANALYSIS OF THE RECOVERY STROKE AND THE OVERALL FIN-BEAT CYCLE PROPULSIVE EFFICIENCY IN THE ANGELFISH. *J. Exp. Biol.* 85:337-342. Apr. 1980. SFA 25(3)
[Dep. Zool., Univ. British Columbia, Wesbrook Mall, Vancouver VT6 1W5, Canada]

80-002065 Boer, B. A. de. A CAUSAL ANALYSIS OF THE TERRITORIAL AND COURTSHIP BEHAVIOUR OF *CHROMIS CYANEA* (POMACENTRIDAE, PISCES). *Behaviour* 73(1-2):1-50. 1980. SFA 25(3)
[Caribbean Mar. Biol. Inst., Curacao, Netherlands Antilles]

80-002066 Buckingham, S. W. and L. Rigley. AGONISTIC BEHAVIOR IN THE TEXAS CICHLID, *CICHLASOMA CYANOGUTTATA*. *Proc. Pa. Acad. Sci.* 53(2):151-155. 1979. SFA 25(3)
[Dep. Biol., Wilkes Coll., Wilkes-Barre, PA 18703] The Texas Cichlid, *Cichlasoma cyanoguttata*, being a substrate spawner, was shown to demonstrate predictable behavior during agonistic encounters with conspecifics in the presence of a shelter. Agonistic behaviors included color pattern variations, fin displays, and body displays. A "ratchet" sound was produced in conjunction with one body display and a hydrodynamic "whoofing" sound was regularly spaced between repetitions of a second body display.

80-002067 Casterlin, M. E. and W. W. Reynolds. DIEL ACTIVITY OF THE BLUESPOTTED SUNFISH *ENNEACANTHUS GLORIOSUS*. *Copeia* 1980(2):344-345. 1 May 1980. SFA 25(3)
[Mar. Biol. Prog., Univ. New England, Biddeford, ME 04005]

80-002068 Colgan, P. and N. Costeloe. PLASTICITY OF BURYING BEHAVIOR BY THE BANDED KILLIFISH, *FUNDULUS DIAPHANUS*. *Copeia* 1980(2):349-351. 1 May 1980. SFA 25(3)
[Biol. Dep., Queen's Univ., Kingston, ON K7L 3N6, Canada]

80-002069 Ebbesson, S. O. E. and D. L. Meyer. THE VISUAL SYSTEM OF THE GUITAR FISH (*RHINOBATOS PRODUCTUS*). *Cell Tissue Res.* 206(2):243-250. Mar. 1980. SFA 25(3)
[D. L. Meyer: Inst. Histol. Neuroanat., Kreuzbergring 36, 3400 Göttingen, West Germany]

80-002070 Godin, J.-G. J. DIEL RHYTHMS OF BEHAVIOR IN JUVENILE PINK SALMON (*ONCORHYNCHUS GORBUSCHA* WALBAUM). *Ph.D. dissertation, Univ. British Columbia* 1979. From Diss. Abstr. Int. B Sci. Eng. 40(11):5168. May 1980. SFA 25(3)

80-002071 Grossman, G. D. FOOD, FIGHTS, AND BURROWS: THE ADAPTIVE SIGNIFICANCE OF INTRASPECIFIC AGGRESSION IN THE BAY GOBY (PISCES: GOBIIDAE). *Oecologia (Berl.)* 45(2):261-266. 1980. SFA 25(3)
[Dep. Wildl. Fish. Biol., Univ. Calif., Davis 95616] The effects of size, sex, bout initiation, past experience, and prior residence were examined with respect to the outcome of intraspecific agonistic contests in the bay

BEHAVIOR (CONTINUED)

80-002071 CONTINUED goby (*Lepidogobius lepidus*). In addition, the adaptive significance of this behavior was examined by investigating the relationship between dominance and access to two potentially limiting resources; food and the burrows of invertebrate symbionts. For heterosexual and male homosexual contests, size and initiation significantly affected bout outcome. Gender did not affect heterosexual encounters. In female homosexual bouts initiation played a significant role in determining contest outcome while size did not. Both past experience and prior residency had significant effects on the outcome of intraspecific encounters. Dominant gobies had increased access to simulated invertebrate burrows and limited food. It appears that intraspecific aggression is an adaptive phenomenon through which access to limiting resources may be mediated.

80-002072 Hanes, S. R. and R. J. Stark. REESTABLISHMENT OF RETINAL-TECTAL SPECIFICITY DURING GOLDFISH OPTIC NERVE REGENERATION. *Proc. Indiana Acad. Sci.* 88:425. 1979. Abstract only. SFA 25(3)
[Dep. Biol., Indiana Univ.-Purdue Univ., Indianapolis, IN 46205]

80-002073 Hopkins, C. D. EVOLUTION OF ELECTRIC COMMUNICATION CHANNELS OF MORMYRIDS. *Behav. Ecol. Sociobiol.* 7(1):1-13. 1980. SFA 25(3)
[Dep. Ecol. Behav. Biol., Univ. Minn., Minneapolis 55455]

80-002074 Horner, K.; O. Sand and P. S. Enger. BINAURAL INTERACTION IN THE COD. *J. Exp. Biol.* 85:323-331. Apr. 1980. SFA 25(3)
[Mar. Lab., Aberdeen, Scotland]

80-002075 Johansen, P. H. and J. A. Cross. EFFECTS OF SEXUAL MATURATION AND SEX STEROID HORMONE TREATMENT ON THE TEMPERATURE PREFERENCE OF THE GUPPY, *POECILIA RETICULATA* (PETERS). *Can. J. Zool.* 58(4):586-588. Apr. 1980. In English with French summ. SFA 25(3)
[Dep. Biol., Queen's Univ., Kingston, ON K7L 3N6, Canada] In a horizontal temperature gradient, male guppies prefer a significantly lower temperature (24.5°C) than females (28.2°C) or juveniles (28.1°C). Treatment of juveniles and females with testosterone lowers their preferred temperatures to that of males. The reduction in the preferred temperature of testosterone-treated juveniles can occur without the development of male secondary sexual characters. Estrogen treatment of juveniles is without effect, as is treatment of males with estrogen or testosterone. It is postulated that testosterone acts at a level of the hypothalamic thermoregulatory centre.

80-002076 Kavaliers, M. CIRCADIAN LOCOMOTOR ACTIVITY RHYTHMS OF THE BURBOT, *LOTA LOTA*: SEASONAL DIFFERENCES IN PERIOD LENGTH AND THE EFFECT OF PINEALECTOMY. *J. Comp. Physiol. A Sens. Neural Behav. Physiol.* 136(3):215-218. 1980. SFA 25(3)
[Dep. Zool. Entomol., Colo. State Univ., Fort Collins 80523] The burbot, *Lota lota*, displayed a free-running circadian locomotor activity rhythm under constant darkness. There was a seasonal change in the length of the circadian period ($\tau$). Fish captured during winter had a mean $\tau$ of 21.2 ± 0.30 h as oposed to a $\tau$ of 23.5 ± 0.25 in summer. Removal of the pineal organ had significant effects on the length and stability of the circadian period. Furthermore, the pineal influences on period length varied with season. In winter, $\tau$ was significantly lengthened (22.1 ± 0.30 h to 23.4 ± 0.50 h) while in summer, $\tau$ was significantly shortened (23.5 ± 0.25 h to 21.9 ± 0.50 h).

BEHAVIOR (CONTINUED)

80-002077 Kerebel, L.-M. and M.-T. Le Cabellec. ENAMELOID IN THE TELEOST FISH *LOPHIUS*. *Cell Tissue Res.* 206(2):211-223. Mar. 1980. In English with French summ. SFA 25(3)
[Fac. Chir. Dent., F.R.A. 35 INSERM, Nantes, France]

80-002078 Konagaya, T. [RESPONSE OF FISH TO LOW-FREQUENCY SOUND.] *Bull. Jpn. Soc. Sci. Fish.* 46(2):125-128. Feb. 1980. In Japanese with English summ. SFA 25(3)
[Fac. Fish., Mie Univ., Edobashi, Tsu 514, Japan] Fish are considered to generate extremely low frequency sound by the motion of the fin or body in water, and to use this sound for mutual communication in schooling. This means that fish may be able to perceive the low-frequency sound produced by the motion of objects in water. This paper deals with the very low-frequency underwater sound produced by the motion of fish and fishing gears in water and the responses of the fish to this sound. Results obtained are summarized as follows: 1) Fish and fishing gears produce short pulses by their motion in water. 2) A rapid pressure change was detected at the net mouth of a wingless model dragnet. 3) The fish responds by rapid swimming or tail flipping to the pulsy sound or the pressure change in water.

80-002079 Konagaya, T. [THE SOUND FIELD OF LAKE BIWA AND THE EFFECTS OF THE CONSTRUCTING SOUND ON THE BEHAVIOR OF THE FISH.] *Bull. Jpn. Soc. Sci. Fish.* 46(2):129-132. Feb. 1980. In Japanese with English summ. SFA 25(3)
[Fac. Fish., Mie Univ., Edobashi, Tsu 514, Japan] In order to clarify the effects of construction sound to fish populations, the change of acoustic environments of Lake Biwa by dredging was observed. Also, the response of fish to dredging sound and swimming direction of fish near the worksite was studied by the use of acoustic biotelemetry. Results obtained are summarized as follows: 1) The spectrum level of the back ground noise of Lake Biwa was within the limits of prevailing noise of the sea. 2) Pressure level of the underwater sound of a dredging boat at a distance of 150 m was about 38 dB, and that of a submerged pipe at a distance of 2 m was 75 dB. The fish showed negative responses and was considered to avoid the acoustic field of worksite.

80-002080 Laming, P. R. and G. E. Savage. PHYSIOLOGICAL CHANGES OBSERVED IN THE GOLDFISH (*CARASSIUS AURATUS*) DURING BEHAVIORAL AROUSAL AND FRIGHT. *Behav. Neural Biol.* 29(2):255-275. June 1980. SFA 25(3)
[Dep. Zool., Queen's Univ. Belfast, Belfast BT7 1NN, Northern Ireland]

80-002081 Luckner, C. L. MORPHOLOGICAL AND BEHAVIORAL POLYMORPHISM IN *POECILIA LATIPINNA* MALES (PISCES: POECILIIDAE). *Ph.D. dissertation, La. State Univ. Agric. Mech. Coll.* 88p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(12, part 1):5572. June 1980. SFA 25(3)

80-002082 Malmqvist, B. HABITAT SELECTION OF LARVAL BROOK LAMPREYS (*LAMPETRA PLANERI*, BLOCH) IN A SOUTH SWEDISH STREAM. *Oecologia (Berl.)* 45(1):35-38. 1980. SFA 25(3)
[Dep. Anim. Ecol., Univ. Lund, S-22362 Lund, Sweden] The burrowing larvae of the brook lamprey *Lampetra planeri* (Bloch) were shown by discriminant analysis to inhabit stream sites having certain qualities. Although a few larvae occurred in far-from-optimal habitats, most larvae selected those with low current velocity, low water depth, a low number of particles in the 0.5-1 mm range, and with low chlorophyll $\alpha$ content. Other factors normally positively attributed to larval lamprey distribution such as organic content, shade, and presence of algae did not improve the discriminant model. The last factor even showed a negative correlation.

BEHAVIOR (CONTINUED)

80-002082 CONTINUED Stream bed stability was considered to be of great importance although it was not possible to estimate quantitatively.

80-002083 McCleave, J. D. SWIMMING PERFORMANCE OF EUROPEAN EEL (*ANGUILLA ANGUILLA* (L.)) ELVERS. *J. Fish Biol.* 16(4):445-452. SFA 25(3)
[Dep. Biol., Univ. Me., Orono 04469] To determine the relation between swimming endurance time and burst swimming speed, elvers of the European eel, *Anguilla anguilla* (L.) were made to swim at speeds from 3.6 to 7.2 L (body lengths)/s in both fresh and sea water. Swimming endurance time of elvers averaging 7.2 cm total length decreased logarithmically with increased swimming speed from 3.0 min at 3.5 L/s to 0.7 min at 5.0 L/s, and again logarithmically but with a lesser slope to 0.27 min at 7.5 L/s. No differences were found between fresh and sea water elvers. In still water, elvers could swim at high speeds for about 10-45m before exhaustion, depending upon speed. Elvers would be able to make virtually no progress against water currents >50 cm/s. Drift in coastal water currents and selective tidal transport probably involve swimming speeds below those tested in this study. Migration into freshwater streams undoubtedly involves avoidance of free stream speeds and a combination of burst and sustained swimming.

80-002084 McKaye, K. R. SEASONALITY IN HABITAT SELECTION BY THE GOLD COLOR MORPH OF *CICHLASOMA CITRINELLUM* AND ITS RELEVANCE TO SYMPATRIC SPECIATION IN THE FAMILY CICHLIDAE. *Environ. Biol. Fishes* 5(1):75-78. 30 Jan. 1980. SFA 25(3)
[Dep. Biol., Yale Univ., New Haven, CT 06520]

80-002085 Meliska, C. J.; J. A. Meliska and H. V. S. Peeke. THREAT DISPLAYS AND COMBAT AGGRESSION IN *BETTA SPLENDENS* FOLLOWING VISUAL EXPOSURE TO CONSPECIFICS AND ONE-WAY MIRRORS. *Behav. Neural Biol.* 28(4):473-486. Apr. 1980. SFA 25(3)
[Psychol. Dep., Monmouth Coll., Monmouth, IL 61462]

80-002086 Melisky, E. L.; J. R. Stauffer, Jr. and C. H. Hocutt. TEMPERATURE PREFERENCE OF BANDED KILLIFISH, *FUNDULUS DIAPHANUS*, FROM SOUTHWESTERN PENNSYLVANIA. *Copeia* 1980(2):346-349. 1 May 1980. SFA 25(3)
[Appalachia Environ. Lab., Univ. Md., Frostburg 21532]

80-002087 Nashimoto, K. [THE SWIMMING SPEED OF FISH IN RELATION TO FISH SIZE AND FREQUENCY OF TAIL BEATING.] *Bull. Jpn. Soc. Sci. Fish.* 46(3):307-312. Feb. 1980. In Japanese with English summ. SFA 25(3)
[Fac. Fish., Hokkaido Univ., Minato-cho, Hokodate 041, Japan]

80-002088 Neproshin, A. Yu.; O. N. Kruchinin and A. S. Fedoseyenkov. THE ACOUSTIC BEHAVIOR OF THE POND SMELT, *HYPOMESUS OLIDUS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):167-169. 1979. SFA 25(3)
[TINRO, Vladivostok, USSR]

80-002089 Partridge, B. L.; T. Pitcher; J. M. Cullen and J. Wilson. THE THREE-DIMENSIONAL STRUCTURE OF FISH SCHOOLS. *Behav. Ecol. Sociobiol.* 6(4):277-288. Mar. 1980. SFA 25(3)
[Dep. Biol., Univ. Miami, Coral Gables, FL 33124]

BEHAVIOR (CONTINUED)

80-002090 Proctor, C.; P. R. L. Mosse and R. C. L. Hudson. A HISTOCHEMICAL AND ULTRASTRUCTURAL STUDY OF THE DEVELOPMENT OF THE PROPULSIVE MUSCULATURE OF THE BROWN TROUT, *SALMO TRUTTA* L., IN RELATION TO ITS SWIMMING BEHAVIOUR. *J. Fish Biol.* 16(3):309-329. Mar. 1980. SFA 25(3)

[Dep. Zool., Univ. Melbourne, Parkville, Victoria, Australia] The differentiation of the myotomal muscle types in the propulsive musculature of *Salmo trutta* has been investigated histochemically and ultrastructurally from the late embryonic to the free-swimming fish at 5 1/2 months post fertilisation and related to observed changes in swimming behaviour. A histochemical and ultrastructural characterisation was also made of the major myotomal muscle fibre types in fingerling and yearling, *S. trutta*. Two distinct populations of muscle cells types can be recognised prior to hatching. The early development of the white fibre population is related to the short, burst-type swimming activity at early stages. The later increase in the development of the red fibre population is directly related to the appearance of sustained swimmming activity. The swimming performance of free-swimming alevins has been investigated and the results are discussed in comparison to adult fish.

80-002091 Quinn, T. P. EVIDENCE FOR CELESTIAL AND MAGNETIC COMPASS ORIENTATION IN LAKE MIGRATING SOCKEYE SALMON FRY. *J. Comp. Physiol. A Sens. Neural Behav. Physiol.* 137(3):243-248. 1980. SFA 25(3)

[Coll. Fish. WH-10, Univ. Wash., Seattle 98195] Radially symmetrical, four-armed tanks were designed for testing the directional preferences of sockeye salmon (*Oncorhynchus nerka*) fry as they commenced up-lake migrations following emergence from gravel nests and river migration to the lake. When tested during the day or night, as appropriate for their migration, fry from two different stocks moved in compass directions corresponding to the directions which they would have to maintain in their up-lake migration. The directional preferences of one population tested during the non-migratory time of day apparently corresponded to the fry's onshore movement. Orientation was maintained under both overcast and clear skies, and under plastic covers as well. A 90° counter-clockwise shift in the horizontal component of the earth's magnetic field was associated with approximately 90° changes in the mean direction of movement of fry at night, even when they were given a view of the sky. During the day, only fish tested in covered tanks displayed redirected movements in the altered field; those tested with a view of the sky showed geographically appropriate movement patterns despite the shifted field.

80-002092 Quinn, T. P. LOCOMOTOR RESPONSES OF JUVENILE BLIND CAVE FISH, *ASTYANAX JORDANI*, TO THE ODORS OF CONSPECIFICS. *Behav. Neural Biol.* 29(1):123-127. May 1980. SFA 25(3)

[Coll. Fish., Univ. Wash., Seattle 98195] Juvenile blind cave fish, *Astyanax jordani*, were tested for locomotor behavior responses to the chemical traces of conspecifics. The fish spent more time in the end of a tank previously occupied by cave fish than in the unoccupied end. There was significant variation in the attraction responses, but no fish were more "attractive" than others. Locomotor activity was reduced in the presence of a conspecific's odors. However, the magnitude of the localized, reduced swimming response was low. It is hypothesized that the aggregation tendency is maintained as a vestige in cave populations by hybridization with the schooling river fish, *A. mexicanus*, from which they apparently evolved.

80-002093 Rechten, C. BROOD RELIEF BEHAVIOUR OF THE CICHLID FISH *ETROPLUS MACULATUS*. *J. Comp. Ethol.* 52(1):77-102. 1980. SFA 25(3)

[Max Planck Inst. Verhaltensphysiol., Seewiesen, West Germany] Quantitative recordings were made of the behaviour of *Etroplus maculatus* parents caring for eggs and wrigglers. Spatial and temporal aspects of brood relief behaviour are examined in connection with parent size, time of

BEHAVIOR (CONTINUED)

80-002093 CONTINUED day, interval since spawning and the frequencies of occurrence of other behaviours. Functional aspects of Cichlid brood relief behaviour are discussed and compared with those of avian nest relief.

80-002094 Rigley, L. and J. Muir. THE ROLE OF SOUND PRODUCTION BY THE BROWN BULLHEAD *ICTULURUS NEBULOSUS*. *Proc. Pa. Acad. Sci.* 53(2):132-134. 1979. SFA 25(3)

[Dep. Biol., Wilkes Coll., Wilkes-Barre, PA 18766] The brown bullhead, *Ictalurus nebulosus*, was found to produce sound during agressive conspecific encounters. The sound was in the form a a "rachet" sound and when recorded sounds were played back to conspecific resident and intruder fishes, there was a decrease in the number of aggressive encounters and an increase in the duration of time between the playback sound and the first encounter.

80-002095 Scarfe, A. D. SPONTANEOUS LOCOMOTOR BEHAVIOR OF GOLDFISH (*CARASSIUS AURATUS*) AND LEMON SHARKS (*NEGAPRION BREVIROSTRIS*) IN RESPONSE TO DIFFERENT VISUAL CONFIGURATIONS. *Ph.D. dissertation, Tex. A&M Univ.* 176p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(12, part 1):5575. June 1980. SFA 25(3)

80-002096 Scott, D. B. C. and C. E. Currie. SOCIAL HIERARCHY IN RELATION TO ADRENOCORTICAL ACTIVITY IN *XIPHOPHORUS HELLERI* HECKEL. *J. Fish Biol.* 16(3):265-277. Mar. 1980. SFA 25(3)

[Zool. Dep., Univ. St. Andrews, Scotland] A study of the epideictic behaviour patterns of male *Xiphophorus helleri* Heckel was made, and the social rank of individual fish in 12 groups of three was assessed over a ten-day period. Straight-line hierarchies were established in most groups. An anatomical study was made to locate the adrenocortical tissue, and the adrenocoritcal activity of each fish was assessed by measuring mean nuclear diameter of 25 adrenocortical cells. Although results were somewhat variable, the highest-ranking fish in 7 out of 12 groups showed the least adrenocortical activity. The remaining two fish showed no significant difference from each other in adrenocortical activity, though their rank was in most cases clearly distinguishable on behavioural grounds.

80-002097 Selset, R. and K. B. Døving. BEHAVIOUR OF MATURE ANADROMOUS CHAR (*SALMO APINUS* L.) TOWARDS ODORANTS PRODUCED BY SMOLTS OF THEIR OWN POPULATION. *Acta Physiol. Scand.* 108(2):113-122. Feb. 1980. SFA 25(3)

[Inst. Zoophysiol., Univ. Oslo, Norway] Mature anadromous char (*Salmo alpinus* L.) of a specific population were tested in behaviour experiments with respect to attraction effects of smolts of the same population, smolt material, and chemical fractions of that material. The char reaction indicated preferences for intestinal contents and possibly bile from own population over skin mucus material and food. Chemical fractions isolated from the intestinal contents were tested for attraction at a concentration of 1.5 X $1/10^9$ g per l. One of the fractions attracted the mature char. The results are discussed in relation to the "migration pheromone" hypothesis proposed by Nordeng (1971) as being crucial for the return of anadromous salmonids to their home river's spawning grounds.

LIFE HISTORY-GENERAL WORKS

80-002098 Anderson, R. M. THE DISTRIBUTION AND ASPECTS OF THE LIFE HISTORY OF *MEDA FULGIDA* IN NEW MEXICO. *Summ. Proc. Annu. Symp. Desert Fish.*

LIFE HISTORY-GENERAL WORKS (CONTINUED)

80-002098 CONTINUED *Counc.* 10:30. 30 Jan. 1980. Abstract only. SFA 25(3)
[N. Mex. State Univ., University Park]

80-002099 DeMartini, E. E. and M. E. Anderson. COMPARATIVE SURVIVORSHIP AND LIFE HISTORY OF PAINTED GREENLING (*OXYLEBIUS PICTUS*) IN PUGET SOUND, WASHINGTON AND MONTEREY BAY, CALIFORNIA. *Environ. Biol. Fishes* 5(1):33-47. 30 Jan. 1980. SFA 25(3)
[Mar. Sci. Inst., Univ. Calif., Santa Barbara] The painted greenling, *Oxylebius pictus*, a hexagrammid fish of shallow, northeastern Pacific rocky habitats was observed and collected near the center of its range at Monterey Bay, California, and near the northern limit of its distribution at Puget Sound. Life history characteristics were compared for breeding stocks from the two areas. Mean and maximum adult body sizes (lengths and wet weights) and longevities of both sexes are greater at Puget Sound. Also, both males and females reach sexual maturity at a smaller body length at Monterey. Age group 0 and 1 juveniles are twice as abundant as adults at Monterey but rare at Puget Sound. Monterey females have greater relative fecundities. Egg development rates are similar at equivalent temperatures; eggs are smaller, however, at Monterey, and thus embryos are smaller at hatching. Length increase is faster for Puget Sound juveniles; adult fish in two areas grow in length at comparable rates, although weight per body length is consistently greater for Monterey fish. These findings reflect a poorer survivorship at Monterey, where natural predation on fertilized eggs and the mortality rates of adult males are greater.

80-002100 Druzhinin, A. D. and N. A. Filatova. SOME DATA ON *PLECTORHINCHUS PICTUS* OF THE FAMILY POMADASYIDAE. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):154-155. 1979. SFA 25(3)
[VNIRO, Moscow, USSR]

80-002101 Gaygalas, K. S. ECOLOGICAL PECULIARITIES AND FISHERIES SIGNIFICANCE OF THE SICHEL, *PELECUS CULTRATUS*, IN THE COURLAND LAGOON BASIN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):74-81. 1979. SFA 25(3)
[Inst. Zool. Parasitol., Lithuanian SSR Acad. Sci., Vilnius, USSR] The distribution, growth, condition factor, spawning, fecundity and population structure of the sichel, *Pelecus cultratus*, in Courland Lagoon were studied. The selectivity of various types of fishing gear and features of sichel fishing during separate fishing periods in this bay are examined.

80-002102 Hempel, G. EARLY LIFE HISTORY OF MARINE FISH. *Wash. Sea Grant Publ., Univ. Wash. Press, Seattle* xvi + 70p. 1979. SFA 25(3)

80-002103 Ismukhanov, Kh. K. MORPHOECOLOGICAL CHARACTERISTICS OF THE EASTERN BREAM, *ABRAMIS BRAMA ORIENTALIS*, ACCLIMATIZED IN BUKHTARMA RESERVOIR. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):38-48. 1979. SFA 25(3)
[Altay Dep., Kazakh Fish. Res. Inst., Ust'-Kamenogorsk, USSR]

80-002104 Messieh, S. N. A BIBLIOGRAPHY OF HERRING (*CLUPEA HARENGUS* L.) IN THE NORTHWEST ATLANTIC. *Fish. Environ. Can. Fish. Mar. Serv. Tech. Rep.* No. 919. iii + 25p. Jan. 1980. In English with French summ. SFA 25(3)
[Dep. Fish. Oceans, Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

LIFE HISTORY-GENERAL WORKS (CONTINUED)

80-002105 Minckley, C. O. RECOVERY OF THE HUMPBACK CHUB, *GILA CYPHA*, AND OBSERVATIONS ON THAT SPECIES, 1977-1978. *Summ. Proc. Annu. Symp. Desert Fish. Counc.* 10:40. 30 Jan. 1980. Abstract only. SFA 25(3)
[Biol. Dep., Mus. North. Ariz., Flagstaff] During 1978, twenty adult humpback chubs were placed at Willow Beach National Fish Hatchery, for propagation purposes. The fish were collected from the Little Colorado River, in the vicinity of its mouth, flown to the south rim of the Grand Canyon, and transported to Willow Beach. All fish arrived in good condition and were in the hatchery raceways within five hours of lift-off from the Little Colorado River. During 1978, 555 humpback chubs were collected. Of these fish, 21.5% (196) were juveniles, and 78.5% (359) were adults. Distribution of this species within the mainstream Colorado River was extended to river mile 194, based on a report from a commercial river runner. General distribution within the system reflects the size of fish, with larger adults preferring water over two meters in depth. Juvenile fish occurred in water less than two meters in depth. Both size groups were usually found in moderate to slow current over silt-sand bottom in the Little Colorado River. Schooling was observed both in adult and juvenile humpback chubs, as was feeding behavior. Schooling fish were observed feeding both on the bottom substrate and the surface film. Adult chubs were observed to take *Cladophora* sp. as well as food from commercial river parties. The stomachs of three young-of-the-year humpback chubs were found by direct examination to contain dipteran Families of Chironomidae, Ceratopogonidae and Dolichopodidae. Reproduction appeared to have occurred in early June based on the small size of the fish collected by seining (mean T. L. = 19 mm). It is suspected that spawning commences in early spring (March) and continues through early summer, as observed. Estimated numbers of humpback chubs, based on seining collections, ranged from 122 fish/hectare in May up to 1527 fish/hectare in June. Tagging operations were also implemented in July of 1978 using 3/8" x 1/8" fingerling tags. To date, 120 humpback chubs have been tagged and none have been recaptured. Major problems faced by this population of humpback chubs are human impact, water fluctuations, and a newly discovered infestation of the anchorworm parasite *Learnea* sp. During October, 54% of the chubs collected were infested.

80-002106 Relyea, K.; T. Vaughan and J. Ferguson. NOTES ON *PSEUDOCHROMIS* RÜPPEL 1835 IN THE NORTHERN ARABIAN GULF. *Senckenbergiana Biol.* 60(3/4):141-146. 1980. SFA 25(3)
[Biol. Dep., Jacksonville Univ., Jacksonville, FL 32211]

80-002107 Sahrhage, D. and R. Schöne. BIOLOGISCHE UNTERSUCHUNGEN AM BLAUEN WITTLING (*MICROMESISTIUS POUTASSOU*) IM NORDOSTATLANTIK. [BIOLOGICAL INVESTIGATIONS ON THE BLUE WHITING (*MICROMESISTIUS POUTASSOU*) IN THE NORTHEAST ATLANTIC.] *Arch. Fischereiwiss.* 30(2-3):81-120. Mar. 1980. In German with English summ. SFA 25(3)
[Inst. Seefisch. Bundesforschungsanst. Fisch., Hamburg, West Germany]

80-002108 Seethaler, K. LIFE HISTORY AND ECOLOGY OF THE COLORADO SQUAWFISH (*PTYCHOCHEILUS LUCIUS*) IN THE UPPER COLORADO RIVER BASIN. *Summ. Proc. Annu. Symp. Desert Fish. Counc.* 10:45-46. 30 Jan. 1980. Abstract only. SFA 25(3)
[Utah State Univ., Logan]

80-002109 Taphorn, D. C. and C. G. Lilyestrom. *PIABUCINA PLEUROTAENIA* REGAN, A SYNONYM OF *P. ERYTHRINOIDES* VALENCIENNES (PISCES: LEBIASINIDAE); ITS DISTRIBUTION, DIET AND HABITAT IN LAKE MARACAIBO BASIN, VENEZUELA. *Copeia* 1980(2):335-340. 1 May 1980. SFA 25(3)
[Univ. Nac. Exp. Llanos Occidentales Ezequiel Zamora (Unellez), Guanare, Portuguesa, Venezuela] Based on meristic, morphometric, coloration and

LIFE HISTORY-GENERAL WORKS (CONTINUED)

80-002109 CONTINUED distributional data, arguments are presented to support placing *Piabucina pleurotaenia* in the synonomy of *P. erythrinoides* (the volador). The volador inhabits most of the clear upland streams of the Maracaibo Basin where it feeds primarily on insects, fish and some vegetable matter. Sexual dimorphism in body and fin size is pronounced, and males have a peculiar modification of the scales above the anal fin. The sensory pore system is well developed in this species. All Maracaibo Basin specimens have an adipose dorsal fin.

80-002110 Yoshida, H. O. SYNOPSIS OF BIOLOGICAL DATA ON BONITOS OF THE GENUS *SARDA*. *NOAA Tech. Rep. NMFS Circ.* 432. iv + 50p. May 1980. SFA 25(3)
[NMFS, Southwest Fish. Cent., Honolulu, HI 96812]

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC.

80-002111 Allen, L. G. STRUCTURE AND PRODUCTIVITY OF THE LITTORAL FISH ASSEMBLAGE OF UPPER NEWPORT BAY, CALIFORNIA. *Ph.D. dissertation, Univ. South. Calif.* 1980. From Diss. Abstr. Int. B Sci. Eng. 40(12, part 1):5523. June 1980. SFA 25(3)

80-002112 Craig, J. F. GROWTH AND PRODUCTION OF THE 1955 TO 1972 COHORTS OF PERCH, *PERCA FLUVIATILIS* L., IN WINDERMERE. *J. Anim. Ecol.* 49(1):291-315. Feb. 1980. SFA 25(3)
[Freshwater Biol. Assoc., Ferry House, Far Sawrey, Ambleside, Cumbria, England] Mean lengths for age for cohorts of perch from 1955 to 1972 were calculated from directly measured fish and back-calculated lengths. Back-calculated lengths were corrected for allometry by using exponent values of 0.814 for immatures and males, and 0.723 for mature females. Back-calculated lengths were not usually significantly different from those measured directly. The von Bertalanffy growth model fitted the data well and values for the model are presented for male (1955 to 1972) and female (1955 to 1971) cohorts. $L_\infty$ values for females were usually higher than the values for males. The general trend in growth since 1955 (and before that period) has been an increase in mean lengths with age and an increase in K and $L_\infty$ values (statistics from the von Bertalanffy growth equation) for both sexes. There was a linear relationship between growth and mortality of cohorts. The correlation between K and Z (annual instantaneous mortality rate) was highly significant ($P< 0.001$) for cohorts from 1964 to 1972. Estimates are given of cohort production from age 2 until an age when the number in the population (N) < 1000. Prior to the 1964 cohort, losses due to reproductive products as a mean percentage of adult production was 20.8% for males and 87.4% for females but in later years was 11.1% for males and 36.0% for females. There were sharp differences in production, consumption and gross (or ecological) efficiency between slow and fast growing cohorts (1955 and 1968). Some approximations were made of the juvenile production, and its contribution to total production was much greater for fast growing cohorts (1968 male = 79%) than slow growing cohorts (1955 male = 59%). Annual production, gonad losses and biomass are given for the years 1961 to 1972. Total production ranged in the north basin from 11.1 $kJ/m^2/yr$ in 1966 to 47.9 $kJ/m^2/yr$ in 1972 and in the south basin from 23.0 $kJ/m^2/yr$ in 1966 to 158.2 $kJ/m^2$ in 1972. Cohort P/B ratios and annual P/B ratios were not found to be constant. Absolute fecundity (F) per unit length has increased over the period of investigation. For a 20 cm perch, $F_{1944/60} = 13,058 \pm 732$ and $F_{1975/76} = 47,580 \pm 5259$. Ecological life tables and age specific fecundity rates have been determined for female cohorts. Factors affecting the net

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

80-002112 CONTINUED reproduction rate are discussed and a model has been developed to predict these effects.

80-002113 Dadzie, S. RECENT CHANGES IN THE FISHERY OF A NEW TROPICAL MAN-MADE LAKE, LAKE KAMBURU (KENYA). *J. Fish Biol.* 16(4):361-367. Apr. 1980. SFA 25(3)

[FAO Reg. Aquacult. Cent. Africa, P.M.B. 6165, Port Harcourt, Nigeria] Five years after inundation, two varieties of *Cyprinus carpio*--the common carp and the mirror carp, have appeared in the commercial fishery in Lake Kamburu. Species of *Tilapia* continue to remain the most abundant fish in the lake and their numbers are on the increase. The second most numerous species is *Barbus* while *Labeo* sp. seems to be declining. The numbers of Mormyrus have declined drastically. Species of the genera *Tilapia*, *barbus* and *Cyprinus* are widely distributed within the lake; *Labeo* prefers the confluence of the rivers entering into the lake and *Mormyrus* has moved upriver.

80-002114 Gilligan, M. R. BETA DIVERSITY OF A GULF OF CALIFORNIA ROCKY-SHORE FISH COMMUNITY. *Environ. Biol. Fishes* 5(2):109-116. 22 Apr. 1980. SFA 25(3)

[Dep. Ecol. Evol. Biol., Univ. Ariz., Tucson 85721] Reef fish community composition in three segments of a peninsular rocky shoreline in the Gulf of California was estimated over four periods by visual observation. 'Point' and 'bay' segments had regular and distinct species compositions over most periods while a 'middle' segment was least distinct but consistently had the greatest number of species. Compositional change along the peninsula was least regular during the coldest sea temperature period (April). Mean species turnover between segments was highest between point and bay. Within segments, the point had greater compositional predictable composition (lowest species turnover). When species with regular frequency of encounter were classified into 'point', 'middle', 'bay', and 'no trend' groups it was found that comparatively more 'point' species had pelagic eggs and comparatively more 'bay' species had demersal eggs. Beta diversity of rocky-shore fishes along the physical gradient of the Punta Doble peninsula reflects a transition between exposed and protected rocky shoreline communities. The correlated physical environmental characteristics associated with exposed and protected habitats are discussed in relation to diversity regulation and dispersal strategies in reef fishes.

80-002115 Kawasaki, T. FUNDAMENTAL RELATIONS AMONG THE SELECTIONS OF LIFE HISTORY IN THE MARINE TELEOSTS. *Bull. Jpn. Soc. Sci. Fish.* 46(3):289-293. Feb. 1980. SFA 25(3)

[Fac. Agric., Tohoku Univ., Sendai 980, Japan]

80-002116 Kovtun, I. F. SIGNIFICANCE OF THE SEX RATIO IN THE SPAWNING POPULATION OF THE ROUND GOBY, *NEOGOBIUS MELANOSTOMUS*, IN RELATION TO YEAR-CLASS STRENGTH IN THE SEA OF AZOV. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):161-163. 1979. SFA 25(3)

[AzNIIRKh, Rostov-on-Don, USSR]

80-002117 Leclerc, J. and G. Power. PRODUCTION OF BROOK CHARR AND OUANANICHE IN A LARGE RAPID, TRIBUTARY OF THE CANIAPISCAU RIVER, NORTHERN QUEBEC. *Environ. Biol. Fishes* 5(1):27-32. 30 Jan. 1980. SFA 25(3)

[Cent. Etud. Nord., Univ. Laval, PQ G1K 7P4, Canada] The age structure of brook charr (*Salvelinus fontinalis*) and ouananiche (*Salmo salar*) stocks inhabiting a large rapid in the river Méo, tributary

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

80-002117 CONTINUED to the Caniapiscau River were used to compare population stability and production of these species in north central Quebec. The brook charr stock was stable whereas ouananiche showed considerable variation in year class strength. Stock estimates were not significantly different for the two species although the brook charr estimate was 1.5 that of the ouananiche. Production estimates differed by a greater margin because of different growth patterns. Brook charr production was estimated at 19.4 kg/ha/yr. Above age 2+ it was 11.4 kg/ha/yr which compares with 4.8 kg/ha/yr for the same age groups of ouananiche.

80-002118 MacCall, A. D. POPULATION MODELS FOR THE NORTHERN ANCHOVY (*ENGRAULIS MORDAX*). *M.A. thesis, Calif. State Univ.* 84p. 1979. From Masters Abstr. 18(2):74. June 1980. SFA 25(3)

The growth of the northern anchovy (*Engraulis mordax*) central stock since 1951 can be described empirically by a logistic growth curve. The maximum average population growth rate is 353,000 short tons per year, and the asymptotic maximum average population size is 3.9 million short tons. The maximum sustainable average yield to a fishery is 484,000 short tons per year. A stochastic model of population growth is developed and is implemented as a Markov process with discrete biomasses as states. The abundance is highly variable in an unharvested state. Various management policies can be examined by the model, providing expected values, variances, and probabilities of various events or conditions.

80-002119 Serchuk, F. M.; C. J. Schmitt and B. Floyd. RAINBOW TROUT: A POPULATION SIMULATION BASED ON INDIVIDUAL RESPONSES TO VARYING ENVIRONMENTAL AND DEMOGRAPHIC PARAMETERS. *Environ. Biol. Fishes* 5(1):15-26. 30 Jan. 1980. SFA 25(3)

[Dep. Fish. Wildl., Mich. State Univ., East Lansing 48824]

80-002120 Van Woert, W. F. EXPLOITATION, NATURAL MORTALITY, AND SURVIVAL OF SMALLMOUTH BASS AND LARGEMOUTH BASS IN SHASTA LAKE, CALIFORNIA. *Calif. Fish. Game* 66(3):163-171. July 1980. SFA 25(3)

[Calif. Dep. Fish. Game, 627 Cypress Ave., Redding 96001] To obtain information on mortality and survival of black bass in Shasta Lake, $5 reward trailer tags were attached to smallmouth bass, *Micropterus dolomieui*, in 1973 and 1975 and to largemouth bass, *M. salmoides*, in 1975. First-year exploitation of 203 to 356 mm (8 to 14 in.) smallmouth bass tagged in 1973 was 0.68, natural mortality was 0.24, and survival was 0.08. First-year exploitation of 254- to 305-mm (10- to 12-in.) smallmouth bass tagged in 1975 was 0.70, natural mortality was 0.28, and survival was 0.02. First-year exploitation of 254- to 406-mm (10- to 16-in.) largemouth bass tagged in 1975 was 0.50, natural mortality 0.28, and survival 0.22. First-year exploitation of both species probably was lower than that indicated by tag returns since anglers were known to release some small bass after removing the tag. Survival of both species may have been underestimated since high turbidity levels in 1974 and the beginning of a 2-year drought in 1976 may have reduced angler use and/or success. High exploitation of smallmouth bass in Shasta Lake is the result of heavy angling pressure and high vulnerability of young smallmouth bass to natural baits. This high exploitation appears to be responsible for the large population of small smallmouth bass in Shasta Lake.

80-002121 Young, D. K. POPULATION DYNAMICS OF *CYPRINODON RADIOSUS*: A PRELIMINARY REPORT. *Summ. Proc. Annu. Symp. Desert Fish. Counc.* 10:51-53. 30 Jan. 1980. SFA 25(3)

[Calif. State Univ., Fresno]

## SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

80-002122 Adams, J. C. and R. V. Kilambi. MATURATION AND FECUNDITY OF REDEAR SUNFISH. *Arkansas Acad. Sci. Proc.* 33:13-16. 1979. SFA 25(3)
[Okla. Water Resour. Bd., Fifth Floor, Jim Thorpe Bldg., Oklahoma City 73105] Based on gonosomatic indices and ovum diameter frequency distributions, the redear sunfish spawns from May through July. Fast growing 2-year-old (above 150 mm) and older fish attain sexual maturity. Mature ovum diameter ranged from 0.60 to 1.30 mm. Fecundity - total length, - total weight, and - age relationships were: $\ln F = 5.95242 + 0.01967L$ ($r^2 = 0.90$), $\ln F = 8.80328 + 0.00594W$ ($r^2 = 0.92$), and $\ln F = 8.19332 + 0.50231A$ ($R^2 = 0.83$), respectively.

80-002123 Andriyashev, A. P.; N. A. Butskaya and T. I. Faleeva. SEXUAL CYCLES OF ANTARCTIC FISHES *TREMATOMUS BERNACCHII* AND *PAGOTHENIA BORCHGREVINKI* (NOTOTHENIIDAE) IN CONNECTION WITH ADAPTATION. *Dokl. Biol. Sci. (Engl. Transl. Dokl. Akad. Nauk SSSR Ser. Biol.)* 248(1-6):1184-1187. Mar. 1980. SFA 25(3)
[Zool. Inst., Acad. Sci. USSR, Leningrad, USSR]

80-002124 Asahina, K.; K. Iwashita; I. Hanyu and T. Hibiya. [ANNUAL REPRODUCTIVE CYCLE OF A BITTERLING, *RHODEUS OCELLATUS OCELLATUS*. *Bull. Jpn. Soc. Sci. Fish.* 46(3):299-305. Feb. 1980. In Japanese with English summ. SFA 25(3)
[Fac. Agric. Vet. Med., Nihon Univ., Setagaya-ku, Tokyo 154, Japan]

80-002125 Bjerknes, V. and A. B. Vaag. MIGRATION AND CAPTURE OF PINK SALMON, *ONCORHYNCHUS GORBUSCHA* WALBAUM IN FINNMARK, NORTH NORWAY. *J. Fish Biol.* 16(3):291-297. Mar. 1980. SFA 25(3)
[Austevoll Stn. Mar. Aquacult., N-5490 Storebo, Norway] Pink salmon transplanted to the north Atlantic coast from the Soviet Union reached a peak in 1973, both in the Soviet Union and in Finnmark. Pink salmon catch statistics were compiled in 1977 for the inshore coastal and fjord areas of Finnmark from the atlantic salmon fisheries conducted locally and outside the coastal limits of Finnmark. The survey indicated a total sea catch of 12,800 specimens or 18,450 kg in Finnmark in 1977. The pink salmon reached the coast in the western regions of Finnmark during the first half of July, after which the main migration continued eastwards along the coast. The migrations into the western fjords were few, with half the total inshore catch captured in the most eastern fjord, Varangerfjord.

80-002126 Bradley, W. K., Jr. MOUTHBROODING AND COURTSHIP BEHAVIOR IN A NEOTROPICAL CICHLID, *GEOPHAGUS HONDAE*. *Fla. Sci.* 43(1):57-59. 1980. SFA 25(3)
[826 S. 13th St., Palatka, FL 32077]

80-002127 Fischer, E. A. THE RELATIONSHIP BETWEEN MATING SYSTEM AND SIMULTANEOUS HERMAPHRODITISM IN THE CORAL REEF FISH, *HYPOPLECTRUS NIGRICANS* (SERRANIDAE). *Anim. Behav. (Baillière Tindall, Publ.)* 28(2):620-633. May 1980. SFA 25(3)
[Popul. Dev. Biol. Group, Sch. Biol. Sci., Univ. Sussex, Falmer, Brighton, Sussex BN1 9QG, England] The behaviour and reproductive ecology of the simultaneously hermaphroditic coral reef fish, *Hypoplectrus nigricans* (Serranidae), the black hamlet, was investigated in an effort to elucidate the relationship between simultaneous hermaphroditism and mating behaviour. The major features of the mating system are as follows. (1) Hamlets spawn only in pairs, one partner releasing eggs and the other fertilizing them. There is no selfing. (2) Eggs are planktonic. There is no parental care.

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

80-002127 CONTINUED (3) The major courtship display serves to advertise that an individual has ripe eggs. (4) A clutch is not released in a single spawn but is parcelled over several, usually with the same partner. (5) Partners generally alternate sex roles with each spawn: that is, they take turns giving up parcels to be fertilized. This active reciprocation of release of eggs, called egg trading, means that reproductive success as a male depends upon the ability to reproduce as a female. Since most of the reproductive effort of an individual is spent on female functions, egg trading provides a fecundity advantage to hermaphroditism, making it evolutionarily stable relative to dioecy (separate sexes). The advantage is analogous to that which parthenogenetic organisms have over sexual ones. The fecundity advantage under egg trading can account for the maintenance, but not the origin of simultaneous hermaphroditism, since hermaphroditism must be established before egg trading can evolve.

80-002128 Fricke, H. W. CONTROL OF DIFFERENT MATING SYSTEMS IN A CORAL REEF FISH BY ONE ENVIRONMENTAL FACTOR. *Anim. Behav. (Baillière Tindall, Publ.)*. 28(2):561-569. May 1980. SFA 25(3)

[Max-Planck-Inst., 8131 Seewiesen, West Germany] The Red Sea coral-dwelling damselfish *Dascyllus marginatus* is organized in stable territorial groups with males dominating all females. The fish live in pairs, harems or multi-male groups. Group size, and the number of sexually active males in a group, are correlated with coral size. Males monopolize and control the coral, attracting potential mates. The experimental alteration of coral sizes, using spherical *Stylophora* corals, resulted in an increase of male numbers, in artificially composed groups, with the increase of coral size. Thus pairs and harems were produced on small corals, multimale groups on big corals. Experiments with unisexual groups revealed a higher survival of females; males are more aggressive to each other, and cause a stronger emigration of subdominants. In *D. marginatus*, group size and the number of sexually active males are essentially restricted by one environmental factor; the number of available hiding places on a coral.

80-002129 Gromov, I. A. THE FECUNDITY OF THE EASTERN CARP, *CYPRINUS CARPIO HAEMATOPTERUS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):98-103. 1979. SFA 25(3)

[Amur Dep., Pac. Res. Inst. Sea Fish. Oceanogr., Khabarovsk, USSR]

80-002130 Johnson, R. A. OXYGEN TRANSPORT IN SALMON SPAWNING GRAVELS. *Can. J. Fish. Aquatic Sci.* 37(2):155-162. Feb. 1980. In English with French summ. SFA 25(3)

[Inst. Water Resour., Univ. Alaska, Fairbanks 99701]

80-002131 Kedric-Brown, A. and R. Vestal. THE BREEDING SYSTEM OF THE BOTTOMLESS LAKES PUPFISH (*CYPRINODON PECOSENSIS*). *Summ. Proc. Annu. Symp. Desert Fish. Counc.* 10:38. 30 Jan. 1980. Abstract only. SFA 25(3)

[Dep. Ecol. Evol. Biol., Univ. Ariz., Tucson] At high population density the breeding system of *Cyprinodon pecosensis* is one of male territoriality. Males established breeding territories on substrates with significant topographic complexity, such as rocky embankments, mats of submerged aquatic vegetation or single rocks scattered over a featureless silty bottom. Females preferred oviposition substrates which coincided with male preferences for territorial sites. Females preferred to oviposit on rocky substrates (93% of a total of 365 spawnings). Male reproductive success depended on territory quality and individual characteristics. Males with territories on rocky substrates had the highest spawning success (13 females mated per 30 min.). Occupants of territories situated primarily on silty substrate had lower spawning success (7 males mated per 30 min.).

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

80-002131 CONTINUED There was a positive correlation between male reproductive success and the topographic complexity of the habitat ($r = 0.57$; $p < 0.005$; $N = 40$). Topographic complexity was defined as the ratio of the area occupied by prominent topographic features to total area of a territory. Both individual characteristics of males and the number of breeding males in an area enhance reproductive success. Males with fully developed breeding colorations had higher spawning rates (4 females mated per 30 min.) than pale males (0.5 females mated per 30 min.). Males defending territories in areas where there were several adjacent territories had a higher reproductive success (1.8 females mated per 30 min.) than solitary territorial males (0.9 females mated per 30 min.).

80-002132 Kennett, C. B. ASPECTS OF MATING BEHAVIOR AND SELECTION IN *POECILIOPSIS* POPULATION COMPLEXES (PISCES: POECILIIDAE). *Ph.D. dissertation, Fordham Univ.* 98p. 1980. From Diss. Abstr. Int. B Sci. Eng. 40(12, part 1):5509. June 1980. SFA 25(3)

80-002133 Kozlowski, L. J. BEHAVIORAL MECHANISMS OF REPRODUCTIVE ISOLATION IN *ETHEOSTOMA SPECTABILE* (AGASSIZ) AND *ETHEOSTOMA CAERULEUM* STORER. *Trans. Mo. Acad. Sci.* 13:198. 1979. Abstract only. SFA 25(3)

[Box 27, Williamsburg, MO 63388] This study was conducted to observe, describe, analyze, and compare the reproductive behavior of *Etheostoma spectabile* and *Etheosotma caeruleum* in order to determine what behavioral mechanisms help maintain reproductive isolation in these two species in South Central Missouri. The darters were observed both in the field in South Central Missouri and also in an artificial stream system. A fine behavioral difference was found in the courtship pattern between these two species. *E. spectabile* utilizes Head Wagging in the courtship sequence, and *E. caeruleum* does not. This, in addition to the slight differences in habitat and the time of spawning contributes to the maintenance of distinct species.

80-002134 Kuklin, A. A. MATURATION AND REPRODUCTION OF THE MUKSUN, *COREGONUS MUKSUN* OF THE YENISEY RIVER. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):91-97. 1979. SFA 25(3)

[Sibrybniiproyekt, USSR] The sexual maturation of the Yenisey muksun is of long duration; specimens of each year-class mature in the course of 10-15 years. The rate of sexual maturation of the muksun is determined mainly by the length of the juvenile stage and the period of protoplasmic growth. The duration of the latter is 5-6 years in fish maturing for the first time, and up to 1 year in fish which are rematuring. In most of the fish trophoplasmic growth begins in the year preceding spawning and lasts from 10 to 16 months. The complete cycle of repeat maturation and reproduction lasts no less than 2 years in the muksun and a greater interval between spawnings is possible. Individual muksun mature for the first time in the 10th-11th years of life, maturation occurs most commonly at an age of 13-15 years. The reproductive potential of the muksun population is determined both by the overall strength of the spawning population and by the ratio between recruitment and carryover.--concl.

80-002135 Laudien, H.; W. Fechner and W. Schumann. ZUR TEMPERATUREABHÄNGIGKEIT DER BALZ MÄNNLICHER GUPPYS, *POECILIA RETICULATA* PETERS (PISCES, CYPRINIDAE). [TEMPERATURE DEPENDENCY OF THE COURTSHIP OF MALE GUPPIES.] *J. Comp. Ethol.* 52(1):1-18. 1980. In German with English summ. SFA 25(3)

[Zool. Inst., Univ. Kiel, West Germany] In poikilothermal animals, modes

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

80-002135 CONTINUED of behaviour as well as other physiological functions are dependent on the environmental temperature. Individual adaptation can decrease or cancel out this dependency. In experiments involving abrupt and slow temperature changes, we were able to prove temperature compensations and stress effects in the courting beahviour of the male *Poecilia reticulata*.

80-002136 Marsh, E. THE EFFECTS OF TEMPERATURE AND PHOTOPERIOD ON THE TERMINATION OF SPAWNING IN THE ORANGETHROAT DARTER (*ETHEOSTOMA SPECTABILE*) IN CENTRAL TEXAS. *Tex. J. Sci.* 32(2):129-142. June 1980. SFA 25(3)
[Dep. Zool., Coll. Nat. Sci., Univ. Tex., Austin 78712] In central Texas, *Etheostoma spectabile* ordinarily breeds from November to April. However, a population exposed to the continuously cold waters released from the hypolimnion of Canyon Lake (Comal County, Tx.) continued to breed well into the summer of 1976. This prolonged breeding season in a thermally altered environment suggested that a thermal cue is important in the termination of the spawning season of *E. spectabile* in central Texas. Breeding individuals of *E. spectabile* were exposed to 1 of the following 4 combinations of temperature and photoperiod: 24 C, 14 light (L):10 dark (D); 24 C, 10L:14D; 14 C, 14L:10D; 14 C, 10L:14D. Females exposed to warm treatments had significantly lower gonad weight (GW)/adjusted body weight (ABW) ratios than did females exposed to cold treatments. Females exposed to different photoperiods showed no significant differences in GW/ABW ratios. Males exposed to warm temperatures for 12 days had significantly lower GW/ABW ratios than did males exposed to cold treatments. Photoperiod had no significant effect on male GW/ABW ratios.

80-002137 Michael, J. H., Jr. REPEAT SPAWNING OF PACIFIC LAMPREY. *Calif. Fish Game* 66(3):186-187. July 1980. SFA 25(3)
[Star Rt. 2, Box 513, Port Townsend, WA 98368]

80-002138 Peters, C. E. and G. W. LaBar. FECUNDITY OF AN UNEXPLOITED POPULATION OF CISCOES IN THREE AREAS OF LAKE CHAMPLAIN. *N.Y. Fish Game J.* 27(1):72-78. Jan. 1980. SFA 25(3)
[Wildl. Biol. Prog., Univ. Vt., Burlington] Estimates of fecundity for ciscoes in three areas of Lake Champlain were based on examination of 108 specimens collected prior to spawning in 1976 and 1977. Absolute fecundity ranged from 6,932 to 24,868 eggs per female. Mean relative fecundity was 56.3 eggs per gram of body weight, which is higher than that reported for exploited populations in the Great Lakes. Based on logarithmic values, absolute fecundity increased linearly with length and weight, but not with age. Ciscoes in eutrophic Malletts Bay were fewer in number, smaller and less fecund, and had a lower condition factor, than those in the Main Lake and Northeast Arm which are mesotrophic to oligotrophic.

80-002139 Power, J. H. and J. D. McCleave. RIVERINE MOVEMENTS OF HATCHERY-REARED ATLANTIC SALMON (*SALMO SALAR*) UPON RETURN AS ADULTS. *Environ. Biol. Fishes* 5(1):3-13. 30 Jan. 1980. SFA 25(3)
[Migratory Fish Res. Inst., Univ. Me., Orono 04469] Hatchery-reared Atlantic salmon returning as adults to Maine's Penobscot River drainage basin were tagged with radio transmitters to permit long-term observation of their movements. Locations of salmon carrying small stomach-emplaced transmitters were periodically determined primarily from an airplane; canoes and road vehicles were also used. Objectives were to determine the patterns, routes and rates of salmon movement; to assess the effect of dams on the migration; and to compare the behavior of salmon that had been imprinted as smolts to headwaters with that of salmon released as smolts near the head of tide. No

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

80-002139 CONTINUED consistent pattern of salmon movement emerged. Movement was erratic with wandering both up and downstream interspersed with position holding. A weak seasonal aspect to the movement was detected, with the minimum numbers moving in early September and the rates and distances of movement decreasing as the season progressed. Salmon often remained at various locations in the rivers for periods of time before subsequently moving. Salmon were also apparently impeded by dams, as on numerous occasions they were observed to approach a dam, then move back downstream. Some differences in behavior were found between the salmon imprinted as smolts to headwaters and those released as smolts at head of tide. Several imprinted salmon homed to a particular tributary when unimpeded by dams or homed by surmounting a dam, and several moved up to the base of the dam. Few unimprinted salmon moved up that tributary. The variable behavior and lack of strong upstream movement may be due to the salmon's lack of genome adapted to the Penobscot River drainage, the scarcity of conspecifics with their possible pheromonal influence, and the lack of a home stream and concomitant motivation to stimulate unimprinted salmon to progress upstream.

80-002140 Pressley, P. H. LUNAR PERIODICITY IN THE SPAWNING OF YELLOWTAIL DAMSELFISH, *MICROSPATHODON CHRYSURUS*. *Environ. Biol. Fishes* 5(2):155-159. 22 Apr. 1980. SFA 25(3)
[Dep. Zool., Univ. Calif., Berkeley 94720]

80-002141 Rinne, J. THE SPAWNING HABITAT AND BEHAVIOR OF *SALMO GILAE* MILLER, A RARE SOUTHWESTERN SALMONID. *Summ. Proc. Annu. Symp. Desert Fish. Counc.* 10:41. 30 Jan. 1980. Abstract only. SFA 25(3)
[Rocky Mtn. For. Range Exp. Stn., Tempe, AZ] The spawning season of *Salmo gilae* in three streams in the Gila National Forest, New Mexico commenced in early April and persisted through June, dependent upon stream elevation. Water temperature and streamflow interacted to induce spawning, however, the former was more important. Spawning commenced at water temperatures of ~8° C. Normally a single or a pair of fish occupied a redd, but three to four fish was not uncommon. Most spawning activity occurred between midday and late afternoon (1100-1600 hours). Fry emerged in 8 to 10 weeks at 15 to 20 mm in size and inhabited riffle areas. Avoidance of pools by fry indicated that cannibalism may occur. Redds were normally located about a quarter the distance of stream width from a bank in waters averaging from 6.0 to 15.0 cm in depth. Fine gravel (2 to 9 mm in size) comprised the greatest percentage (by weight) of substrate materials. Spawning fish selected redd sites more based on depth of water and substrate than they did on velocity. Normally, cover was less than 5 m from a redd site. Redds ranged in size from less than 0.1 $m^2$ to near 2.0 $m^2$. Redd depressions averaged 3 to 4 cm in depth.

80-002142 Yaron, Z.; M. Cocos and H. Salzer. EFFECTS OF TEMPERATURE AND PHOTOPERIOD ON OVARIAN RECRUDESCENCE IN THE CYPRINID FISH *MIROGREX TERRAE-SANCTAE*. *J. Fish Biol.* 16(4):371-382. Apr. 1980. SFA 25(3)
[Dep. Zool., George A. Wise Fac. Life Sci., Tel-Aviv Univ., Tel-Aviv, Israel]

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

80-002143 Bozeman, E. L., Jr. and J. M. Dean. THE ABUNDANCE OF ESTUARINE LARVAL AND JUVENILE FISH IN A SOUTH CAROLINA INTERTIDAL CREEK. *Estuaries* 3(2):89-97. June 1980. SFA 25(3)

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

80-002143 CONTINUED
[Belle W. Baruch Inst. Mar. Biol. Coastal Res., Univ. S.C., Columbia 29208] The fall and winter population of larval fish in a small intertidal creek was measured. The creek was blocked at high tide, and the immature fish were captured in a channel net designed for consistent quantitative sampling as they left with the ebbing tide. A total of 573,739 individuals with a biomass (preserved wet weight) of 66.1 kg were captured during the eight month sampling period (October 1974-May 1975). Twelve families, 13 genera, and 16 species were represented, with five species comprising 99.3% of the fish captured. The five species were: *Leiostomus xanthurus* (53.5%), *Lagodon rhomboides* (31.7%), *Brevoortia tyrannus* (11.9%), *Micropogon undulatus* (1.7%), and *Myrophis punctatus* (0.5%). The net was efficient, the catch was seasonal, and the greatest larval abundance occurred in February and March.

80-002144 Leclerc, J. and G. Power. LACK OF MOVEMENT OF BROOK CHARR AND OUANANICHE IN THE CANIAPISCAU RIVER, NORTHERN QUEBEC. *Environ. Biol. Fishes* 5(1):71-74. 30 Jan. 1980. SFA 25(3)
[Cent. Etud. Nord., Univ. Laval, PQ G1K 7P4, Canada] Marking experiments, 1974-76, showed that brook charr *Salvelinus fontinalis* and juvenile ouananiche *Salmo salar* moved very little during the summer or from year to year in the upper reaches of the Caniapiscau River, north central Quebec. The fish were concentrated in rapid sections of the river and there was little exchange between rapids.

80-002145 Leyzerovich, Kh. A. and M. N. Mel'nikova. THE SEAWARD MIGRATION OF DWARF MALES OF THE ATLANTIC SALMON, *SALMO SALAR*, AND THEIR RETURN TO THE RIVER. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):164-167. 1979. SFA 25(3)
[GosNIORKh, Leningrad, USSR]

80-002146 McBride, D. N. HOMING OF ARCTIC CHAR, *SALVELINUS ALPINUS* (LINNAEUS) TO FEEDING AND SPAWNING SITES IN THE WOOD RIVER LAKE SYSTEM, ALASKA. *Alaska Dep. Fish Game Inf. Leafl.* No. 184. iv + 23p. Mar. 1980. SFA 25(3)
[Alaska Dep. Fish Game, Div. Commer. Fish., Anchorage]

80-002147 Ogawa, Y. and T. Nakahara. MODE OF SPATIAL DISTRIBUTION OF PELAGIC FISH WITHIN THE COASTAL FISHING GROUND IN THE SOUTHWESTERN JAPAN SEA. *Jpn. J. Ecol.* 30(1):31-43. Mar. 1980. In English with Japanese summ. SFA 25(3)
[Yamaguchi Pref. Open-Sea Fish. Exp. Stn., Nagato 759-41, Japan] The present paper deals with patterns in spatial distributions of pelagic fish (*Engraulis japonica, Trachurus japonicus, Scomber japonicus, Etrumeus micropus* and *Sardinops melanosticta*) in coastal waters. It is based on the daily catch data obtained by eleven small purse seiners. It was found that commercial fishery could act as an efficient sampling method to study movements of fish group at a level of elemenatry population. Each species of the pelagic fish always constituted a separate and stable group, elementary population with a size of between 6 km and 11 km in an average diameter. Careful examinations of daily maps showing the distribution of each fish species suggested the presence of interrelationships between groups of pelagic fish.

80-002148 Quinn, N. J. ANALYSIS OF TEMPORAL CHANGES IN THE FISH ASSEMBLAGES IN SERPENTINE CREEK, QUEENSLAND. *Environ. Biol. Fishes* 5(2):117-133. 22 Apr. 1980. SFA 25(3)

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

80-002148 CONTINUED
[Dep. Fish. Technol., Univ. Technology, P.O. Box 793, Lae, Papua New Guinea]

80-002149 Shershnev, A. P. and A. I. Zhul'kov. FEATURES OF THE DOWNSTREAM MIGRATION OF YOUNG PINK SALMON AND SOME INDICES OF THE EFFICIENCY OF REPRODUCTION OF THE PINK SALMON; *ONCORHYNCHUS GORBUSCHA*, FROM PRITORNAYA RIVER. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):114-119. 1979. SFA 25(3)
[SakhTINRO, South Sakhalinsk, USSR]

80-002150 Siebert, D. J. MOVIMENTOS DE TRES PECES EN ARAVAIPA CREEK, ARIZONA. [MOVEMENTS OF THREE FISHES IN ARAVAIPA CREEK, ARIZONA.] *Summ. Proc. Annu. Symp. Desert Fish. Counc.* 10:48. 30 Jan. 1980. In English and Spanish. Abstract only. SFA 25(3)
[Ariz. State Univ., Tempe]

80-002151 Southward, A. J. and B. McK. Bary. OBSERVATIONS ON THE VERTICAL DISTRIBUTION OF EGGS AND LARVAE OF MACKEREL AND OTHER TELEOSTS IN THE CELTIC SEA AND ON THE SAMPLING PERFORMANCE OF DIFFERENT NETS IN RELATION TO STOCK EVALUATION. *J. Mar. Biol. Assoc. U.K.* 60(2):295-311. May 1980. SFA 25(3)
[Mar. Biol. Assoc., Citadell Hill, Plymouth, England]

FOODS/FEEDING

80-002152 Armitage, T. M. and W. S. Alevizon. THE DIET OF THE FLORIDA POMPANO (*TRACHINOTUS CAROLINUS*) ALONG THE EAST COAST OF CENTRAL FLORIDA. *Fla. Sci.* 43(1):19-26. 1980. SFA 25(3)
[Va. Inst. Mar. Sci., Coll. William and Mary, Gloucester Point, VA 23062] The diet of the Florida pompano (*Trachinotus carolinus*) was investigated by examing stomach contents of adults from the Indian River and juveniles from the surf zone off Brevard County. Juveniles consumed primarily benthic crustaceans, mainly *Emerita talpoida*, and the bivalve, *Donax variabilis*. The diet of the adults consisted mainly of bivalve molluscs in the families Tellinidae, Mactridae, and Arcidae. In comparison with juveniles, the adults displayed a decrease in the number of planktonic organisms that are selected as prey items. Availability of prey appears to be more important than caloric content of prey in determining the diet of *T. carolinus*. The diet of adult pompano may be more diverse in those individuals found near the inlet regions of the lagoon. Our findings differ from previous studies that have determined bivalves to be more important in the diet of juvenile Florida pompano and crustaceans to be dominant in the diet of adult Florida pompano.

80-002153 Bakanov, A. I. and L. N. Strizhnikova. ON THE RELATION BETWEEN CHANGES IN THE FOOD SUPPLY AND THE FEEDING OF THE EASTERN BREAM *ABRAMIS BRAMA ORIENTALIS*, IN THE VOLGA ARM OF RYBINSK RESERVOIR. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):119-127. 1979. SFA 25(3)
[Inst. Biol. Inland Waters, USSR Acad. Sci., Borok, Yaroslavl Region, USSR] In the Volga arm of Rybinsk reservoir an increased biomass of benthos has been observed in recent years. As a result the food supply of the population of the Eastern bream, *Abramis brama orientalis*, has risen and the frequency of occurrence in the food of the bream of all the main groups of

FOODS/FEEDING (CONTINUED)

80-002153 CONTINUED invertebrates has increased considerably, but in spite of the sharp increase in stomach fullness and the improvement in the structure of the food supply, condition factors have barely changed. The increase in the biomass of the benthos has had a positive effect on the linear and weight growth of the bream.

80-002154 Brownell, C. L. WATER QUALITY REQUIREMENTS FOR FIRST-FEEDING IN MARINE FISH LARVAE. I. AMMONIA, NITRITE, AND NITRATE. *J. Exp. Mar. Biol. Ecol.* 44(2/3):269-283. 22 Apr. 1980. SFA 25(3)

[17281 S. Clackamas River Dr., Oregon City, OR 97045] The tolerance of marine fish larvae to ammonia, nitrite, and nitrate was investigated using the decrease in first-feeding incidence following a 24-h exposure as the criterion of response. Seven species, all hatched from pelagic eggs collected at sea, were used in these experiments; two soleids (*Heteromycteris capensis* Kaup, *Synaptura kleini* (Bonaparte)), a gadid (*Gaidropsarus capensis* (Kaup)), and four sparids (*Diplodus sargus* (L.), *Lithognathus mormyrus* (L.), *Pachymetopon blochi* (Val.), and an unidentified species). Concentrations that inhibited first-feeding are compared to 24-h $LC_{50}$'s for the same species, and to concentrations that are known to induce lethal and sublethal responses in other teleost species. Judging from its effect on first-feeding, un-ionized ammonia is considered to be a potential hazard in the rearing tank; nitrite and nitrate are non-toxic at levels likely to be encountered in practical marine fish culture. Data are presented on the age at first-feeding and point of no return for 10 species.

80-002155 Brownell, C. L. WATER QUALITY REQUIREMENTS FOR FIRST-FEEDING IN MARINE FISH LARVAE. II. pH, OXYGEN, AND CARBON DIOXIDE. *J. Exp. Mar. Biol. Ecol.* 44(2/3):285-298. 22 Apr. 1980. SFA 25(3)

[17281 S. Clackamas River Dr., Oregon City, OR 97045] Previously unfed larvae representing eight species of marine teleosts (a soleid, *Heteromycteris capensis* Kaup; a cynoglossid, *Trulla capensis* Kaup; a gadid, *Gaidropsarus capensis* (Kaup); a congiopodid, *Congiopodus spinifer* (Smith); three sparids, *Diplodus sargus* (L.), *Pachymetopon blochi* (Val.) and an undentified species; and a centracanthid, *Pterosmaris axillaris* (Boulenger)) were exposed for 24 h to various pH's and concentrations of dissolved oxygen and carbon dioxide and then tested for their ability to first-feed. Mortalities recorded during the 24-h exposure went into the fitting of response curves and the calculation of the $LC_{50}$ and $LC_{10}$. The incidence of successful first-feeding during the subsequent 4-h exposure to food yielded values for the $EC_{50}$ and $EC_{10}$. The exposure to sub-optimal conditions continued during the 4-h feeding test. The sensitivity of first-feeding larvae to high pH and dissolved oxygen may pose hazards for the marine fish culturists; low pH appears to be harmful (at least in the short term) only at levels below about pH 6.0; carbon dioxide poisoning is of doubtful importance in practical fish culture. There were only minor interspecific differences in calculated 24-h first-feeding $EC_{50}$'s, which suggests general applicability of the results to a wide variety of first-feeding marine fish larvae.

80-002156 Coates, D. PREY-SIZE INTAKE IN HUMBUG DAMSELFISH *DASCYLLUS ARUANUS* (PISCES, POMACENTRIDAE) LIVING WITHIN SOCIAL GROUPS. *J. Anim. Ecol.* 49(1):335-340. Feb. 1980. SFA 25(3)

[Dep. Zool., Univ. Gezira, P.O. Box 20, Wad Medani, Sudan] Field observations were made on the feeding behaviour of individuals amongst social groups of *D. aruanus*. The sizes of prey taken were investigated by the analysis of stomach contents. There was a clear relationship between the size of prey taken and the rank of an individual within its social group. On removal of the larger individuals from a social group, the smaller

FOODS/FEEDING (CONTINUED)

80-002156 CONTINUED individuals began to take prey previously destined for the former. These results are related to what is known from previous work about the movements of *D. aruanus* whilst feeding as a social group. It is concluded that the size of prey taken by *D. aruanus* is influenced by the social habit of this species. The relative position of an individual within its social group influences its subsequent prey intake.

80-002157 de Silva, S. S.; P. R. T. Cumaranatunga and C. D. de Silva. FOOD, FEEDING ECOLOGY AND MORPHOLOGICAL FEATURES ASSOCIATED WITH FEEDING OF FOUR CO-OCCURRING CYPRINIDS (PISCES: CYPRINIDAE). *Neth. J. Zool.* 30(1):54-73. Mar. 1980. SFA 25(3)
[Dep. Zool., Vidyalankara Campus, Univ. Sri Lanka, Sri Lanka]

80-002158 Ellison, J. P. DIETS OF MOUNTAIN WHITEFISH, *PROSOPIUM WILLIAMSONI* (GIRARD), AND BROOK TROUT, *SALVELINUS FONTINALIS* (MITCHILL), IN THE LITTLE WALKER RIVER, MONO COUNTY, CALIFORNIA. *Calif. Fish Game* 66(2):96-104. Apr. 1980. SFA 25(3)
[Calif. Dep. Fish Game, P.O. Box 47, Yountville 94599] Diets of brook trout, *Salvelinus fontinalis* (Mitchill), and mountain whitefish, *Prosopium williamsoni* (Girard), in July are described and compared to other studies. Diets were compared statistically and shown to be significantly different. Stomachs of brook trout contained insects of both terrestrial and aquatic origin, indicating a possible subsistence on the drift, whereas whitefish stomachs contained mostly immature aquatic insects, suggesting a bottom feeding habit. Differences between the diets of brook trout and whitefish are probably the result of differential feeding habits.

80-002159 Giles, N. A STOMACH SAMPLER FOR USE ON LIVE FISH. *J. Fish Biol.* 16(4):441-444. Apr. 1980. SFA 25(3)
[Sch. Life Sci., Dep. Biol. Soc., Univ. Coll. Buckingham, MK18 1EG, England] A stomach sampler for live fish is described and its construction outlined; 50 adult perch were sampled, subsequently killed and dissected to assess the efficiency of the device. Survival of previously sampled fish was followed using individually recognizable dorsal fin tags.

80-002160 Gilson, R. F. and A. Benson. PREY PREFERENCE AND SIZE-SELECTIVE PREDATION BY THE MOTTLED SCULPIN (*COTTUS BAIRDI BAIRDI* GIRARD). *Proc. Pa. Acad. Sci.* 53(2):135-138. 1979. SFA 25(3)
[622 Venango Ave., Cambridge Springs, PA 16403] Selective feeding habits of two mottled sculpin (*Cottus bairdi bairdi* Girard) size classes were examined in an experimental riffle of a West Virginia stream. Selection was determined by comparing sculpin stomach contents to prey abundance in the benthos. Each sculpin group selectively consumed specific prey items. Taxonomic diversification in prey consumption between sculpin size classes was demonstrated. In general, sculpins selectively consumed the largest individuals of a prey taxon.

80-002161 Gophen, M. FOOD SOURCES, FEEDING BEHAVIOUR AND GROWTH RATES OF *SAROTHERODON GALILAEUM* (LINNAEUS) FINGERLINGS. *Aquaculture* 20(2):101-115. June 1980. SFA 25(3)
[Kinneret Limnol. Lab., P.O. Box 345, Tiberias, Israel] Feeding habits and growth rates of the fingerlings of *Sarotherodon galilaeum* (Linnaeus) were studied experimentally. Seven types of food were given. Fingerlings fed on 'Forell pellets' (45% protein) had the highest growth rate compared with chlorophytes, mosquito larvae, 'Carp pellets' (35% protein), Lake zooplankton and fresh *Peridinium*. Gut analyses of

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80-002161 CONTINUED small fingerlings sampled in the lake during the winter (November-February) indicate that they collect food, mostly algae, from the bottom of shallow waters. Fingerlings fed experimentally on chlorophytes had the lowest growth rate. It is suggested that food conditions for small (< 5 g) fingerlings in Lake Kinneret during the winter months are suboptimal.

80-002162 Grossman, G. D.; R. Coffin; and P. B. Moyle. FEEDING ECOLOGY OF THE BAY GOBY (PISCES: GOBIIDAE). EFFECTS OF BEHAVIORAL, ONTOGENETIC, AND TEMPORAL VARIATION ON DIET. *J. Exp. Mar. Biol. Ecol.* 44(1):47-59. 8 Apr. 1980. SFA 25(3)

[Dep. Wildl. Fish. Biol., Univ. Calif., Davis 95616] The ontogenic, diel, seasonal, and yearly variations in gut fullness, diet, and prey diversity for a California estuarine gobiid (*Lepidogobius lepidus* Girard) were examined. Also the feeding behavior of this species was described. Small (<50 mm, SL) and large (J ≥ 50 mm, SL) gobies consumed similar prey types in different proportions. Major prey items were polychaetes, harpacticoid copepods, gammarid amphipods, molluscs, and other crustaceans. Diets of large and small gobies were not significantly correlated, and larger fish had a more diverse diet. Small fish fed at all times while larger gobies fed primarily at night. Changes in diet may be related to differential prey preferences, feeding chronologies, and increases in fish size. Both large and small gobies displayed seasonal differences in diet and prey diversity. Year-to-year changes in diet also were noted for both size classes. The bay goby uses different feeding behaviors to capture sedentary and motile prey and appears to forage opportunistically. This behavior is probably advantageous in an environment which fluctuates drastically.

80-002163 Hulberg, L. W. and P. Graber. DIET AND BEHAVIORAL ASPECTS OF THE WOLF-EEL, *ANARRHICHTHYS OCELLATUS*, ON SANDY BOTTOM IN MONTEREY BAY, CALIFORNIA. *Calif. Fish Game* 66(3):172-177. July 1980. SFA 25(3).

[Holmes & Harver, Inc., Antarctic Div., 999 Town & Country Rd., Orange, CA 92668] We studied the diet and behavior of wolf-eels occurring near artificial structures on a sandy bottom in Monterey Bay, California, to obtain information about their biology and natural history. Diet was determined by examining stomach contents. The principal prey items consumed were the slender crab, *Cancer gracilis*, and the sand dollar, *Dendraster excentricus*. Other species were of minor importance in their diet. Our data suggest that wolf-eels, in our study area, are noctural predators which forage over wide areas for food. Scuba divers observed wolf-eel behavior. The individuals observed displayed strong territorial, homing, and itinerant behaviors. Based on the numbers of individuals collected and observed at our stations, the wolf-eel population of Monterey Bay may be quite large.

80-002164 Janssen, J. and S. B. Brandt. FEEDING ECOLOGY AND VERTICAL MIGRATION OF ADULT ALEWIVES (*ALOSA PSEUDOHARENGUS*) IN LAKE MICHIGAN. *Can. J. Fish. Aquatic Sci.* 37(2):177-184. Feb. 1980. In English with French summ. SFA 25(3)

[Loyola Univ. Chicago, 6525 North Sheridan Rd., Chicago, IL 60626]

80-002165 Johnson, J. H. and N. H. Ringler. DIETS OF JUVENILE COHO SALMON (*ONCORHYNCHUS KISUTCH*) AND STEELHEAD TROUT (*SALMO GAIRDNERI*) RELATIVE TO PREY AVAILABILITY. *Can. J. Zool.* 58(4):553-558. Apr. 1980. In English with French summ. SFA 25(3)

[N.Y. State Dep. Environ. Conserv., Albany 12233] Monthly diets of juvenile coho salmon and steelhead trout and the composition of the bottom and drift

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80-002165 CONTINUED fauna were examined in a tributary of Lake Ontario. From June through September coho fed most heavily on terrestrial invertebrates, whereas steelhead fed primarily on benthic invertebrates. Diet overlap ($C_\lambda$) between coho and steelhead was not significant. The diet of coho was closely associated with the composition of the drift; the diet of steelhead was more closely associated with the bottom fauna. Food selection may be influenced by observed differences in distribution (riffle versus pool) of sympatric steelhead and coho salmon, but mode of feeding (surface versus bottom) may also play a role. Because of the close relationship between drift composition and diet in coho, we hypothesize that diel variation in diet will be greater in coho than in steelhead.

80-002166 Kokeš, J. THE FOOD EATEN BY THE FRY OF CHUB, LEUCISCUS CEPHALUS, IN THE ROKYTNÁ RIVER. *Folia Zool.* 28(4):361-370. 1979. In English with Russian summ. SFA 25(3)

[Inst. Vert. Zool., Czechoslovak Acad. Sci., Brno, Czechoslovakia] The food eaten by the chub fry in the Rokytná River consisted mainly of animal items. Of greatest importance were chironomid larvae which, during certain months, were supplemented or replaced by other items, above all, mayfly larvae and caddis worms. The chub fry subsisted mainly on aquatic organisms; terrestrial ones constituted only supplementary food; and the vegetable component was negligible. The variation in trophic diversity showed a marked maximum in August and September, and a marked minimum in January. Chub fry of all size groups consumed almost identical diets. However, there were differences in the index of fulness which attained considerably higher values in the smallest fish examined in June than in bigger fish during the remaining months.

80-002167 Lambert, Y. and G. J. Fitzgerald. SUMMER FOOD AND MOVEMENTS OF THE ATLANTIC TOMCOD *MICROGADUS TOMCOD* (WALBAUM) IN A SMALL TIDAL CREEK. *Nat. Can. (Que.)* 106(5-6):555-559. Sept.-Dec. 1979. In English with French summ. SFA 25(3)

[Dep. Biol., Univ. Laval, PQ G1K 7P4, Canada] Daily sampling of the fish community of a tidal creek, Rivière des Vases near Isle-Verte, Québec, indicated the presence of *Microgadus tomcod* from the end of May until the middle of July in 1978. Captured fish were grouped into four size classes: class I (85-120 mm) and class II (121-165 mm) made up the majority. Stomach content analysis of these two size classes showed that amphipod and chironomid larvae were the most important food items with amphipods being more important for class II than for class I fish. Polychaetes and crustacean larvae were more common in the diet of class III fish.

80-002168 Marais, J. F. K. ASPECTS OF FOOD INTAKE, FOOD SELECTION, AND ALIMENTARY CANAL MORPHOLOGY OF *MUGIL CEPHALUS* (LINNAEUS, 1958), *LIZA TRICUSPIDENS* (SMITH, 1935), *L. RICHARDSONI* (SMITH, 1846), AND *L. DUMERILI* (STEINDACHNER, 1869). *J. Exp. Mar. Biol. Ecol.* 44(2/3):193-209. 22 Apr. 1980. SFA 25(3)

[Univ. Port Elizabeth, P.O. Box 1600, Port Elizabeth 6000, South Africa] Feeding periodicity, selection efficiency and food consumption of *Liza dumerili* (Steindachner, 1869) and *L. richardsoni* (Smith, 1846) were determined. The effects of particle size and nature of ingested food on aspects of the morphology of the alimentary canal of *L. dumerili*, *L. richardsoni*, *Mugil cephalus* (Linnaeus, 1958) and *Liza tricuspidens* (Smith, 1935) are discussed. It was found that the dominant mullet species in the Swartkops estuary (South Africa) not only exhibit different feeding periodicities (*L. dumerili* and *L. richardsoni*) but that selected material in all the species differs in chemical as well as physical

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80-002168 CONTINUED properties. Alimentary canals of each species are morphologically well adapted for selection, ingestion and digestion of its preferred food items. These factors reduce interspecific competition among the different mullet species.

80-002169 Montgomery, W. L. and S. D. Gerking. MARINE MACROALGAE AS FOODS FOR FISHES: AN EVALUATION OF POTENTIAL FOOD QUALITY. *Environ. Biol. Fishes* 5(2):143-153. 22 Apr. 1980. SFA 25(3)

[Woods Hole Oceanogr. Inst., Woods Hole, MA 02543] A revitalized view of feeding by herbivorous marine fishes is sought through two questions. First, What characteristics of major taxa of algae identify them as predictably high or low quality foods? Second, are marine algae valuable foods for fishes which do not mechanically disrupt cell walls and do not harbor specialized enzymes or microbes capable of lysing cell walls? Energy, ash and nutrient content of 16 species of marine algae were employed to assess food quality of fleshy red, green, brown and calcareous red algae. On the basis of ash, calories, total protein and total lipid content, fleshy algae should be superior to calcareous algae as foods for fishes; in addition, green algae should be superior to brown algae and brown algae superior to red algae. When the probable digestibility of storage and extracellular carbohydrates is considered, green and red algae are predicted superior to brown algae as food. Two species of damselfishes (Pomacentride) from the Gulf of California, *Eupomacentrus rectifraenum* and *Microspathodon dorsalis*, eat red and green algae and ignore brown and calcareous algae. They feed, therefore, in a fashion consistent with predictions based only on algal chemistry. These fishes absorb at least 20-24% of the biomass, 57-67% of the protein, 46-56% of the lipid and 37-44% of the carbohydrate contained in algae eaten in the wild. Since these damselfishes do not masticate their food, it appears that herbivorous fishes can digest major fractions of algal nutrients without mechanical destruction of algal cells.

80-002170 Ney, J. J.; E. D. Ricci and W. R. Reynolds. TROPHIC RELATIONS AMONG YOUNG-OF-YEAR SPORT FISH SPECIES IN THE LITTORAL ZONE OF VIRGINIA RESERVOIRS. *Va. J. Sci.* 30(2):77. 1979. Abstract only. SFA 25(3)

[Dep. Fish. Wildl. Sci., VPI&SU, Blacksburg, VA 24061] Food habits of coexisting young-of-year fishes were examined from summer cove rotenone catches in Claytor and Smith Mountain Lakes. In the former, diets of three endemic species, largemouth bass, crappie and smallmouth bass, were compared to the food habits of the exotic, white bass. Diets of the three native species demonstrated partial resource partitioning, but white bass food habits were congruent with crappie, indicating possible trophic competition. In Smith Mt. Lake, diets of native largemouth bass and stocked striped bass were analyzed. Food habits by major category did not differ significantly between the species, although striped bass fed more heavily on fish while largemouth bass utilized a high proportion of neustonic insects. In both situations, dietary overlap between young-of-year native and exotic sport species indicates the possibility of trophic competition which may affect growth and survival. Predictions of impact of exotic introductions should include detailed analysis of this overlooked aspect of interspecific relations.

80-002171 Schreiber, D. C. RELACIONES DE ALIMENTACION DE PECES EN ARAVAIPA CREEK, ARIZONA. [FEEDING INTERRELATIONSHIPS OF FISHES OF ARAVAIPA CREEK, ARIZONA.] *Summ. Proc. Annu. Symp. Desert Fish. Counc.* 10:44. 30 Jan. 1980. In Spanish and English. Abstract only. SFA 25(3)

[Univ. Okla., Norman] Food habits of seven native species of fishes were examined over a 13-month period in Aravaipa Creek, Graham County, Arizona. Availability of foods to the fishes was estimated by sampling benthic communities and stream drift. Three trophic patterns were presented: herbivory by a mountain-sucker (*Pantosteus clarki*); omnivory by longfin

FOODS/FEEDING (CONTINUED)

80-002171 CONTINUED dace (*Agosia chrysogaster*); and carnivory by the remaining five species (*Gila robusta*, *Meda fulgida*, *Rhinichthys osculus*, *Tiaroga cobitis*, and *Catostomus insignis*). Ephemeropteran nymphs were the predominant food of the carnivorous fishes, and of the omnivore, and were the dominant invertebrate in both benthos and drift. When absolute densities and average individual body sizes of mayfly nymphs decreased dramatically, three fish species each shifted to a different alternate prey, and three others did not obviously respond. (One species, *G. robusta*, was not studied quantitatively.) Fishes which responded to alternate prey increased special feeding behavior and spatial partitioning of habitat. Those which did not respond remained as generalized feeders. Interspecific interactions related to feeding habits are probably minimal in Aravaipa Creek because of the abundance of food organisms and spatial segregation of the fishes.

80-002172 Targett, T. E. TROPHIC ECOLOGY AND STRUCTURE OF COASTAL ANTARCTIC FISH COMMUNITIES. *Ph.D. dissertation, Univ. Me.* 86p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(12, part 1):5527. June 1980. SFA 25(3)

80-002173 Ware, R. R. THE FOOD HABITS OF THE WHITE CROAKER *GENYONEMUS LINEATUS* AND AN INFAUNAL ANALYSIS NEAR AREAS OF WASTE DISCHARGE IN OUTER LOS ANGELES HARBOR. *M.A. thesis, Calif. State Univ.* 175p. 1979. From Masters Abstr. 18(2):84. June 1980. SFA 25(3)

Studies of the benthic infauna and the food habits of the white croaker *Genyonemus lineatus* (Ayres) (Pisces: Sciaenidae) in Outer Los Angeles Harbor were conducted between January 1976 and January 1977. The benthos was impoverished near the tuna cannery outfalls, but abundances and species counts increased within a short distance. Classification analysis clustered the infaunal stations into three site groups and species into five assemblages. *Genyonemus* displayed omnivorous food habits and fed on 132 invertebrate taxa which included planktonic, epibenthic, and infaunal species. The food habits of *Genyonemus* were influenced by the fish's size, proximity to the waste discharges, and seasonal fluctuations of prey numbers. Feeding selectivity on benthic species was related to the diversity of the infaunal community. Amorphous fish cannery effluent and fish muscle tissue, which presumably originated from the canneries, were consumed near the outfalls by approximately five percent of the total number of *Genyonemus* examined.

80-002174 Warner, D. J. STOMACH CONTENT ANALYSIS OF BROOK TROUT AND RAINBOW TROUT. *Blue Jay* 38(1):15-16. Mar. 1980. SFA 25(3)

[For. Technol. Sch., Hinton, AB, Canada]

80-002175 Weihs, D. HYDRODYNAMICS OF SUCTION FEEDING OF FISH IN MOTION. *J. Fish Biol.* 16(4):425-433. Apr. 1980. SFA 25(3)

[Dep. Aeronaut. Eng., Technion-Israel Inst. Technol., Haifa, Israel] Forward motion was shown to increase the efficiency of suction feeding by causing the ingested volume to be predominantly in front of the fish, instead of being a sphere centered on the fish mouth. This increases the distance from which a prey, located in front of the predator, can be ingested by suction. A general hydrodynamic model of the external effects of the suction process is presented, showing that this is dependent upon a single non-dimensional parameter, the ratio of a characteristic mouth dimension, divded by the forward swimming speed and the suction time. Data for large-mouth bass, *Micropterus salmoides* show that the observed average forward velocity while feeding, of 3.1 body length/s, serves to increase the ingestion range by more than 60% over suction while not moving.

FOODS/FEEDING (CONTINUED)

80-002176 Zur, O. and S. Sarig. OBSERVATIONS ON THE FEEDING OF COMMON CARP (*CYPRINUS CARPIO*) ON CHIRONOMID LARVAE. *Bamidgeh* 32(1):25-26. Mar. 1980. SFA 25(3)
[Minist. Agric., Fish. Dep., Genosar, P.O.B. 33, Tiberias, Israel] The Common Carp (*Cyprinus carpio* L.) is a well known predator on midge larvae (Chironomidae) both under natural conditions and when grown in fish ponds. In this work, 30 young carp (95-105mm length) were individually fed midge larvae under aquarium conditions. The resulting high rate of larval consumption (up to 65 larvae consumed per fish within 4 hours) was in direct contrast to previously published data.

AGE AND GROWTH

80-002177 Ashley, K. W. and D. L. Garling, Jr. IMPROVED METHOD FOR PREPARING PECTORAL SPINE SECTIONS OF CHANNEL CATFISH FOR AGE DETERMINATIONS. *Prog. Fish-Cult.* 42(2):80-81. Apr. 1980. SFA 25(3)
[Dep. Fish. Wildl. Sci., VPI&SU, Blacksburg, VA 24061]

80-002178 Beaulieu, M.-A.; S. U. Qadri and J. M. Hanson. AGE, GROWTH, AND FOOD HABITS OF THE PUMPKINSEED SUNFISH, *LEPOMIS GIBBOSUS* (LINNAEUS), IN LAC VERT, QUÉBEC. *Nat. Can. (Que.)* 106(5-6):547-553. Sept.-Dec. 1979. In English with French summ. SFA 25(3)
[Dep. Biol., Univ. Ottawa, Ottawa, ON K1N 6N5, Canada] The pumpkinseed, *Lepomis gibbosus* (Linnaeus), was the dominant fish species of the littoral zone of Lac Vert, Québec. The length-weight relationship was: log WT = 3.195 log FL - 5.008. Fulton's coefficient of condition averaged 2.35 (FL) for ages 0+ to 7+. Back calculations of fork length were determined and the ultimate length ($L_\infty$) for Lac Vert pumpkinseed was derived from the Walford graph as 179.4 mm. There were 3 males caught for every 2 females. Maturity was attained at age 3+. The annual mortality rate was 81% between ages 4+ and 7+. The diet consisted mainly of dipterans, cladocerans, ostracods, and decapods.

80-002179 Biette, R. M. and G. H. Geen. GROWTH OF UNDERYEARLING SOCKEYE SALMON (*ONCORHYNCHUS NERKA*) UNDER CONSTANT AND CYCLIC TEMPERATURES IN RELATION TO LIVE ZOOPLANKTON RATION SIZE. *Can. J. Fish. Aquatic Sci.* 37(2):203-210. Feb. 1980. In English with French summ. SFA 25(3)
[Fish. Br., Ontario Minist. Nat. Resour., Queen's Park, Toronto, ON M7A 1W3, Canada]

80-002180 Brady, D. R. AGE DETERMINATION UTILIZING CALCIFIED ANNULI IN THE DENTARY BONE OF THE PADDLEFISH (*POLYODON SPATHULA*). *Proc. Nebr. Acad. Sci. Affl. Soc.* 90:5. 1980. Abstract only. SFA 25(3)
[Dep. Biol., Univ. Nebr., Omaha 68182] Age determination of Paddlefish (*Polyodon spathula*) is accomplished by counting growth rings (annuli) in the dentary bone. Prior techniques employed unstained preparations which made evaluation difficult. In this study the cartilagenous nature and presence of calcification in the Paddlefish was utilized histochemically for age determination. A modified LaMarca technique, employing the calcium specific properties of Alizarin Red S, was applied to 23 jaw samples covering 12 age classes. Samples were taken from the dentary bone angle using a 'Dremel' saw. The thin sections were then placed in a solution composed of saturated Alizarin Red S and 0.2% sodium hydroxide (1:9) for six hours, rinsed in distilled water, differentiated in 3% hydrogen peroxide for three to six hours and stored in 70% ethanol. Results show clear to light pink regions between dark red annuli.

AGE AND GROWTH (CONTINUED)

80-002181 Frost, W. E. and C. Kipling. THE GROWTH OF CHARR, *SALVELINUS WILLUGHBII* GÜNTHER, IN WINDERMERE. *J. Fish Biol.* 16(3):279-289. Mar. 1980. SFA 25(3)

[C. Kipling: Freshwater Biol. Assoc., Ambleside, Cumbria, England] The growth of charr (*Salvelinus willughbii* Günther) caught in Windermere from 1941-1952 has been studied. Sclaes were used for determination of age and back-calculation of length for age. Autumn and spring spawners, males and females, and charr of normal and dwarf growth were treated separately. In fish of normal growth, the spring spawners were significantly smaller than the autumn spawners at ages 1 and 2 years, and significantly larger from age 4 years onwards. There was little difference in growth between males and females within the two spawning populations. Charr of lengths of less than 200 mm at age 4 years were considered to be dwarfs. Mean lengths at capture of male charr were: autumn spawners normal growth 272 mm, dwarf 218 mm; spring spawners normal growth 327 mm, dwarf 194 mm. The oldest recorded age was 8 years.

80-002182 Kakuda, S. and K. Nakai. ON THE AGE AND GROWTH OF *NIBEA ALBIFLORA*. *Bull. Jpn. Soc. Sci. Fish.* 46(2):139-143. Feb. 1980. SFA 25(3)

[Fac. Appl. Biol. Sci., Hiroshima Univ., Fukuyama 720, Japan] In order to clarify the age and growth of *Nibea albiflora* in the Seto Inland Sea, samples were collected during one year from the landings picked up from the Sea. Each scale removed from the sample specimen was examined and measured. The results of analysis of the annual ring on the scales show that one annulus is formed once a year, in the month of June and July. As the spawning season runs from May to August and since most specimens of fish spawn in June and July, the time of the formation of the new annulus is approximately in accordance with the spawning season. The standard length of this species found in the Seto Inland Sea is 151, 238, 305 and 357 mm on an average at the ages of full 1, 2, 3 and 4 years, respectively. The general growth formula for this species is adequately expressed by the following equation ascribed to Bertalanffy: $L_t=529(1-e^{-0.262t-0.0736})$. The growth of the yearling immature fish was studied on samples collected in August, September and November. This growth, on the basis of an analysis of the progression of mean and mode in succesive length-frequency distributions of the immature fishes, was discussed as compared with the growth estimated from the monthly changes of the marginal growth index of the scale.

80-002183 Kohlhorst, D. W.; L. W. Miller and J. J. Orsi. AGE AND GROWTH OF WHITE STURGEON COLLECTED IN THE SACRAMENTO-SAN JOAQUIN ESTUARY, CALIFORNIA: 1965-1970 AND 1973-1976. *Calif. Fish Game* 66(2):83-95. Apr. 1980. SFA 25(3)

[Bay-Delta Fish. Proj., Calif. Dep. Fish Game, 4001 N. Wilson Way, Stockton 95205] AGES OF WHITE STURGEON, *Acipenser transmontanus*, collected in the Sacramento-San Joaquin Estuary from 1965 to 1970 and from 1973 to 1976 were estimated from transverse sections of pectoral fin rays. Sturgeon were difficult to age and there was considerable disagreement between individuals interpreting ages. Estimates of male and female growth rates were not significantly different. A von Bertalanffy growth curve was calculated for ages 0-21 from the 1973-1976 collection. A length-weight relationship was estimated from 1965-1970 data. Estimated growth rate was similar in 1965-1970 and 1973-1976, but was lower than in 1954. It was not possible to determine if a recent decrease in growth rate was real or was due to different aging techniques. Possible causes of reduced growth are discussed.

80-002184 Misra, R. K. STATISTICAL COMPARISONS OF SEVERAL GROWTH CURVES ON THE VON BERTALANFFY TYPE. *Can. J. Fish. Aquatic Sci.* 37(6):920-926. June 1980. In English with French summ. SFA 25(3)

[Dep. Fish. Oceans, P.O. Box 5667, St. John's, NF A1C 5X1, Canada]

AGE AND GROWTH (CONTINUED)

80-002185 Refstie, T. GENETIC AND ENVIRONMENTAL SOURCES OF VARIATION IN BODY WEIGHT AND LENGTH OF RAINBOW TROUT FINGERLINGS. *Aquaculture* 19(4):351-357. Apr. 1980. SFA 25(3)

[Dep. Anim. Genet. Breeding, Agric. Univ. Norway, 1432 Ås-NLH, Norway] Environmental and genetic factors influencing the growth rate of rainbow trout were studied. Body weight and length at a standard age were significantly affected by fist-feeding date and number of fish held in a tank. The estimates of heritabilites found for different year-classes varied. The heritabilities estimated from the total data after adjustment for first-feeding date and density were 0.06 for weight and 0.20 for length using the sire components of variance. Calculated from the dam components, the heritabilities were 1.04 for weight and 0.63 for length. The genetic and phenotypic correlations between length and weight estimated from the total data were 1.02 and 0.93, respectively.

80-002186 Ricker, W. E. CHANGES IN THE AGE AND SIZE OF CHUM SALMON (*ONCORHYNCHUS KETA*). *Can. Dep. Fish. Oceans Tech. Rep.* No. 930. vii + 99p. Apr. 1980. In English with French summ. SFA 25(3)

[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Both in British Columbia and in Alaska, size of chums at a given age has decreased since 1951 along with a general decrease in ocean temperatures. To determine whether this is an accidental or a meaningful coincidence, the residuals of temperature and size from their respective linear regressions on time were computed and compared, during 1951-1975. Weight residuals were positively but weakly correlated with temperature residuals in the last year (approximately) of life, and negatively correlated with the temperature 1 or 2 years earlier. However, all such correlations were small; the corresponding regressions were only 1/3 to 1/10 of the change in weight actually oabserved, and were sometimes of the wrong sign. In addition, chums were small during the late 1940s when temperatures were high. Thus it is still problematical whether ocean temperature changes, within the range observed, have had any significant effect on the size of chum salmon in British Columbia.--From abstr.

80-002187 Rossi, R. and P. Villani. A BIOLOGICAL ANALYSIS OF EEL CATCHES, *ANGUILLA ANGUILLA* L., FROM THE LAGOONS OF LESINA AND VARANO, ITALY. *J. Fish Biol.* 16(4):413-423. Apr. 1980. SFA 25(3)

[Inst. Zool., Univ. Ferrara, Italy] A study of eel catches from Lesina (444 specimens) and Varano lagoons (324 specimens), in southern Adriatic, Italy, was made. Male silver eels in Lesina ranged from 33.4-51.5 cm in length, with a mean of 42.6 cm; from 50-240 g in weight, with a mean of 141 g and were 1.5-6.5 years old with a mean of 2.5 years. The average length of male silver eels in Varano lagoon was 40.5 cm (range 31-48.5 cm); the average weight was 122 g (range 80-220 g) and a mean age of 2.6 years (range 1.5-7.5 years). The females are bigger, heavier and older than the males with, in Lesina, a mean length of 61 cm (range 50.9-74.3 cm), a mean weight of 438 g (range 240-730 g) and a mean age of 3.4 years (range 1.5-6.5). The average length of Varano female silver eels was 58 cm (range 50.8-72.5 cm), and the average weight was 383 g (range 225-840 g). They were 1.5-7.5 years old, with an average of 3.8 years. Female silver eels were only 20% of the population at Lesina and 10% at Varano. In comparison with the silver eel populations of the North Adriatic lagoons, the North Sea or the Atlantic Ocean , the silver eels of Lesina and Varano show a greater growth rate, are younger and have a sex ratio in favour of the males. The water temperature, higher than in other countries, could be an important factor affecting the differences in age and growth rates between Lesina and Varano silver eels and those of other waters.

80-002188 Sainsbury, K. J. EFFECT OF INDIVIDUAL VARIABILITY ON THE VON BERTALANFFY GROWTH EQUATION. *Can. J. Fish. Aquatic Sci.* 37(2):241-247. Feb. 1980. In English with French summ. SFA 25(3)

[Div. Fish. Oceanogr., CSIRO, P.O. Box 21, Cronulla 2230, Australia]

AGE AND GROWTH (CONTINUED)

80-002189 Schmidt, R. E. and M. C. Fabrizio. DAILY GROWTH RINGS ON OTOLITHS FOR AGING YOUNG-OF-THE-YEAR LARGEMOUTH BASS FROM A WILD POPULATION. *Prog. Fish-Cult.* 42(2):78-80. Apr. 1980. SFA 25(3)
[Colder Conserv. Ecol. Stud. Cent., Fordham Univ., 31 Whipporwill Rd., Armonk, NY 10504]

80-002190 Shelbourn, J. E. EARLY GROWTH RATES OF CHUM SALMON FRY (*ONCORHYNCHUS KETA*) IN THE LABORATORY IN FRESH AND SALT WATER. *Can. Dep. Fish. Oceans Tech. Rep.* No. 937. iii + 6p. Apr. 1980. In English with French summ. SFA 25(3)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Specific growth rates were obtained for chum fry (*Oncorhynchus keta*) acclimated to three temperatures and fed excess ration over a 28-day period, starting at an initial weight of 0.35 g. The rates were 1.8 (5°C), 4.4 (10°C), 5.9 (15°C), and 5.9 (15°C, 28°/oo s.w.) % wet weight/day. The growth rates are compared with those obtained for other salmonid species, with a consideration of the diet of wild chum fry.

80-002191 Shireman, J. V.; D. E. Colle and M. J. Maceina. GRASS CARP GROWTH RATES IN LAKE WALES, FLORIDA. *Aquaculture* 19(4):379-382. Apr. 1980. SFA 25(3)
[Aquatic Weed Res. Cent., Univ. Fla., Gainesville] Grass carp (*Ctenopharyngodon idella*) were collected from Lake Wales, Florida, a hydrilla (*Hydrilla verticillata*) infested lake, for a 4-year period. Average daily growth per year ranged from 10.0 to 10.4 g/day. Grass carp averaged 962 mm total length and 15.0 kg after 48 months.

80-002192 Wolfert, D. R. AGE AND GROWTH OF ROCK BASS IN EASTERN LAKE ONTARIO. *N.Y. Fish Game J.* 27(1):88-90. Jan. 1980. SFA 25(3)
[Scheid Rd., RD Box 381E, Huron, OH 44839]

80-002193 Worthmann, H. THE EARLY GROWTH STAGES OF THE PESCADA (*PLAGIOSCION MONTI* SOARES). *Arch. Fischereiwiss.* 30(2-3):145-156. Mar. 1980. In English with German and Portuguese summ. SFA 25(3)
[Inst. Nac. Pesq. Amazônia, Manaus, Brasil]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC.

80-002194 Alkahem, H. F. FRESHWATER FISHES OF SAUDI ARABIA. *Ph.D. dissertation, Colo. State Univ.* Nov. 1979. SFA 25(3)
[Dep. Fish. Wildl. Biol., Colo. State Univ., Fort Collins 80523] This work is the first scientific collection and reports on freshwater fishes from large areas of Saudi Arabia. About 600 specimens representing 8 native known species, seven Cyprinids and one Cyprinodont were discussed. Three new *Cyprinion* were discovered. The first record of non-native fish (*Gambusia affinis*) from Saudi Arabia is given. Several new distributions are recorded. Comprehensive appraisal of geological, geographical, climatic history are correlated with zoogeographical evidence and interpretation of degree of divergence in present living species to provide interpretation of factors explaining present distribution and taxonomy of freshwater fishes of Arabia.

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

80-002195 Allendorf, F. W.; D. M. Espeland; D. T. Scow and S. Phelps. COEXISTENCE OF NATIVE AND INTRODUCED RAINBOW TROUT IN THE KOOTENAI RIVER DRAINAGE. *Proc. Mont. Acad. Sci.* 39:28-36. 1980. SFA 25(3)
[Dep. Zool., Univ. Mont., Missoula 59812] Rainbow trout (*Salmo gairdneri*) have been suspected to be native to some Montana drainages, although previous reports have indicated the contrary. We collected and electrophoretically examined 218 rainbow trout from six sampling locations in the Kootenai River drainage of northwestern Montana and Idaho with the goal of detecting any extant native populations. Large allelic differences exist among these samples collected within a small geographical area. Two of the population samples share close affinity to other inland rainbow trout populations and are very different from hatchery stocks of rainbow trout that have been planted in this area. One population sample was found to have intermediate frequencies, indicating an apparently random mating population containing both native and introduced trout. We conclude that populations of native and introduced rainbow trout, as well as their hybrids, presently exist in this drainage.

80-002196 Beecher, H. A. and B. H. Beecher. FIRST RECORD OF *COUESIUS PLUMBEUS* (AGASSIZ) (OSTEICHTHYES: CYPRINIDAE) FROM WASHINGTON. *Syesis* 12:175-176. 1979. SFA 25(3)
[1118 Skyridge St. SE, Olympia, WA 98503]

80-002197 Chaloner, W. G.; P. L. Forey; B. G. Gardiner; A. J. Hill and V. T. Young. DEVONIAN FISH AND PLANTS FROM THE BOKKEVELD SERIES OF SOUTH AFRICA. *Ann. S. Afr. Mus.* 81(3):127-157. Feb. 1980. SFA 25(3)
[Birbeck Coll., Univ. London, England]

80-002198 Coad, B. W. A PROVISIONAL, ANNOTATED CHECK-LIST OF THE FRESHWATER FISHES OF IRAN. *J. Bombay Nat. Hist. Soc.* 76(1):86-105. Apr. 1979. SFA 25(3)
[Ichthyol. Sect., Natl. Mus. Nat. Sci., Ottawa, ON K1A 0M8, Canada]

80-002199 Crossman, E. J. and H. D. Van Meter. ANNOTATED LIST OF THE FISHES OF THE LAKE ONTARIO WATERSHED. *Great Lakes Fish. Comm. Tech. Rep.* No. 36. 25p. June 1979. SFA 25(3)
[Dep. Ichthyol. Herpetol., Royal Ontario Mus., Toronto, ON M5S 2C6, Canada] This annotated list of the fishes of Lake Ontario and its watershed is based on published distribution records, museum collections, and reports of fish surveys that confirm the occurrence of fish species dating back to the 1850's. It includes 130 forms (129 spp. + the hybrid splake), 20 of which have disappeared or are extremely rare today. Considering species present only in the lake proper, 64 were reported in 1929, and 51 of those remained in 1972-73 (13 having disappeared). Seventeen species and the splake are fishes not known to have occurred in the lake in 1929 or were introduced since then. A list of 86 references pertinent to the study of the fish fauna of the watershed is given. The present list, started in 1972, includes some information from as late as 1976.

80-002200 D'Croz, L. and A. A. Averza. OBSERVACIONES SOBRE LA ABUNDANCIA Y DIVERSIDAD DE LAS POBLACIONES DE PECES ESTUARINOS EN EL CARIBE DE PANAMÁ. [OBSERVATIONS ON THE ABUNDANCE AND DIVERSITY OF ESTUARINE FISH POPULATIONS OF THE CARIBBEAN COAST OF PANAMA.] *Rev. Biol. Trop.* 27(2):189-201. 1979. In Spanish with English summ. SFA 25(3)
[Lab. Biol. Mar., Escuela Biol., Univ. Panama, Panama]

80-002201 Deacon, J. E. ENDANGERED AND THREATENED FISHES OF THE WEST. *Summ. Proc. Annu. Symp. Desert Fish. Counc.* 10:34. 30 Jan. 1980. Abstract only. SFA 25(3)
[Univ. Las Vegas, Las Vegas, NV]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

80-002201 CONTINUED

80-002202 Dexter, R. W. THE KIRTLAND-STORER CORRESPONDENCE ON OHIO FISHES (1838-45) AND A KIRTLAND-BAIRD COLLECTION OF OHIO FISHES (1853). *Kirtlandia* No. 32. p. 1-19. 16 June 1980. SFA 25(3)
[Dep. Biol. Sci., Kent State Univ., Kent., OH 44242] Excerpts from 22 letters that Dr. Jared Potter Kirtland sent to Dr. David Humphreys Storer (1838-45) have been selected to illustrate the problems Kirtland faced in developing studies on the fishes of Ohio, and his growth from a beginner to the leading authority on the fish fauna of Ohio. Also, a list of 45 species of fishes collected by Dr. Kirtland and Spencer Fullerton Baird in August of 1853 from Yellow Creek and the Mahoning River is given with a list of 16 species reported to them from the area, but not collected by them. Current names as recognized by Trautman (1957) are added.

80-002203 Elser, A. A.; M. W. Gorges and L. M. Morris. DISTRIBUTION OF FISHES IN SOUTHEASTERN MONTANA. *Mont. Dep. Fish Wildl. Parks* v + 132p. Apr. 1980. Available from Mont. Dep. Fish Game, Box 430, Miles City 59301. SFA 25(3)

80-002204 Fitch, J. E. THE BIGSCALE GOATFISH, *PSEUDUPENEUS GRANDISQUAMIS* (GILL, 1863), ADDED TO CALIFORNIA'S MARINE FAUNA. *Calif. Fish Game* 66(2):123-124. Apr. 1980. SFA 25(3)
[2657 Averill Ave., San Pedro, CA 90731]

80-002205 Flescher, D. D. GUIDE TO SOME TRAWL-CAUGHT MARINE FISHES FROM MAINE TO CAPE HATTERAS, NORTH CAROLINA. *NOAA Tech. Rep. NMFS Circ.* 431. iii + 34p. Mar. 1980. SFA 25(3)
[NMFS, Woods Hole, MA 02543]

80-002206 Fusaro, C. and S. Anderson. FIRST CALIFORNIA RECORD: THE SCALLOPED HAMMERHEAD SHARK, *SPHYRNA LEWINI*, IN COASTAL SANTA BARBARA WATERS. *Calif. Fish Game* 66(2):121-123. Apr. 1980. SFA 25(3)
[Mar. Sci. Inst., Univ. Calif., Santa Barbara 93106]

80-002207 Goren, M. ON THE OCCURRENCE OF *ACENTROGOBIUS BELISSIMUS* (PISCES: GOBIIDAE) IN THE RED SEA. *Isr. J. Zool.* 28(2/3):160-162. 1979. SFA 25(3)
[Dep. Zool., Tel Aviv Univ., Tel Aviv, Israel]

80-002208 Hendrickson, D. UN ESTUDIO DEL ICTIOFAUNA DEL RIO YAQUI. [A SURVEY OF THE RIO YAQUI ICHTHYOFAUNA.] *Summ. Proc. Annu. Symp. Desert Fish. Counc.* 10:36. 30 Jan. 1980. In English and Spanish. Abstract only. SFA 25(3)
[Ariz. State Univ., Tempe]

80-002209 Hergenrader, G. L. CURRENT DISTRIBUTION AND POTENTIAL FOR DISPERSAL OF WHITE PERCH (*MORONE AMERICANA*) IN NEBRASKA AND ADJACENT WATERS. *Am. Midl. Nat.* 103(2):404-406. Apr. 1980. SFA 25(3)
[Sch. Life Sci., Univ. Nebr., Lincoln 68588] The white perch (*Morone americana*) was accidentally introduced into a flood control reservoir in eastern Nebraska where it developed a large population. It subsequently escaped from the reservoir and has been collected in both lotic and lentic environments downstream in the Platte and Missouri River drainages. In 1977 it was captured in Buckley 3F, a flood control reservoir in the Little Blue

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

80-002209 CONTINUED River drainage. Water from the Little Blue River eventually enters Tuttle Creek Reservoir and the Kansas River in Kansas. At present there are no barriers to prevent the white perch from spreading throughout the Kansas River drainage.

80-002210 Hickey, C. R., Jr. and J. W. Lester. MARINE FISHES OF SOUTHERN ORIGIN IN NEW YORK WATERS AND THEIR CONTRIBUTION TO THE FISHERY. *N.Y. Fish Game J.* 27(1):99-102. Jan. 1980. SFA 25(3)
[U.S. Nucl. Regulatory Comm., Washington, DC 20555]

80-002211 Hillis, D. M.; E. Milstead and S. L. Campbell. INLAND RECORDS OF *FUNDULUS GRANDIS* (CYPRINODONTIDAE) IN TEXAS. *Southwest. Nat.* 25(2):271-272. 15 May 1980. SFA 25(3)
[Strecker Mus., Baylor Univ., Waco, TX 76703]

80-002212 Jeffers, C. D. and E. J. Bacon. A DISTRIBUTIONAL SURVEY OF THE FISHES OF TEN MILE CREEK IN SOUTHEASTERN ARKANSAS. *Arkansas Acad. Sci. Proc.* 33:46-48. 1979. SFA 25(3)
[Biol. Dep., Univ. Ark., Monticello 71655]

80-002213 Kapp, H. RESULTS OF THE RESEARCH CRUISES OF FRV "WALTHER HERWIG" TO SOUTH AMERICA. LV. CHAETOGNATHA FROM THE PATAGONIAN SHELF IN FEBRUARY 1971. *Arch. Fischereiwiss.* 30(2-3):125-135. Mar. 1980. In English with German summ. SFA 25(3)
[Zool. Mus., Univ. Hamburg, West Germany]

80-002214 Konstantinov, K. G. and G. P. Nizovtsev. THE BASKING SHARK, *CETORHINUS MAXIMUS*, IN KANDALAKSHA BAY OF THE WHITE SEA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):155-156. 1979. SFA 25(3)
[PINRO, Murmansk, USSR]

80-002215 Kristensen, J. and M. G. Foy. FIRST RECORD OF THE ROUND WHITEFISH IN ALBERTA. *Can. Field-Nat.* 94(2):180-182. Apr.-June 1980. SFA 25(3)
[LGL Ltd., Environ. Res. Assoc., 10110 124 St., Edmonton, AB T5N 1P6, Canada]

80-002216 Lehner, C. E. A LATITUDINAL GRADIENT ANALYSIS OF ROCKY SHORE FISHES OF THE EASTERN PACIFIC. *Ph.D. dissertation, Univ. Ariz.* 329p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(11):5128. May 1980. SFA 25(3)

80-002217 McAda, C. W. and R. S. Wydoski. THE RAZORBACK SUCKER, *XYRAUCHEN TEXANUS*, IN THE UPPER COLORADO RIVER BASIN, 1974-76. *U.S. Fish Wildl. Serv. Tech. Pap.* 99. 15p. 1980. SFA 25(3)
[U.S. FWS, 447 East Main St., Vernal, UT 84078] The razorback sucker (*Xyrauchen texanus*), which has declined in abundance in the upper Colorado River primarily because of man's impact on the environment, has been recommended for listing as "threatened" in the U.S. Department of the Interior's list of threatened or endangered species. During the present investigation, razorback suckers were nevertheless found in relatively large concentrations at two restricted locations--the mouth of the Yampa River and a flooded gravel pit connected to the Colorado River near Grand Junction, Colorado. Razorback suckers spawned in April and May,

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

80-002217 CONTINUED when water temperatures were 6 to 15 C. Estimated fecundity ranged from 24,490 eggs for a fish 529 mm in total length to 76,576 for a fish 485 mm long. Estimated ages based on scale examinations indicated that the razorback suckers collected had completed from 4 to 9 growing seasons; all were mature. Razorback suckers from the Colorado River were significantly larger than those of the same estimated age from the Green and Yampa rivers, probably because water temperature was higher in the Colorado River than in the other two streams.

80-002218 McCollum, J. L. and C. J. Quertermus. DISTRIBUTION OF FISHES IN THE DOG RIVER DRAINAGE. *Ga. J. Sci.* 38(1):55-63. Jan. 1980. SFA 25(3)
[C. J. Quertermus: Biol. Dep., West Ga. Coll., Carrollton 30118]

80-002219 Miller, R. R. "NATIVE" TROUT OF THE RIO YAQUI. *Summ. Proc. Annu. Symp. Desert Fish. Counc.* 10:39. 30 Jan. 1980. Abstract only. SFA 25(3)
[Univ. Mich., Ann Arbor] The three described trouts of the American Southwest are briefly reviewed. Preliminary observations are given on 13 samples of unidentified trout from Rio Yaqui and adjacent Rio Mayo, northern Mexico. A total of 154 specimens were collected between May and July 1978. Probably most, if not all, of these represent native stocks, although absolute purity cannot be determined for certain from preserved fish. These trout are more closely related to the rainbow than to the cutthroat series, and some osteological characters suggest a possible close relationship to *Salmo gilae*. Morphometric data and additional skeletal studies are needed as are the determination of karyotypes and biochemical traits before a confident identification will be possible.

80-002220 Morin, R.; J. Dodson and G. Power. ESTUARINE FISH COMMUNITIES OF THE EASTERN JAMES-HUDSON BAY COAST. *Environ. Biol. Fishes* 5(2):135-141. 22 Apr. 1980. SFA 25(3)
[J. Dodson: GIROQ, Dep. Biol., Univ. Laval, PQ G1K 7P4, Canada]

80-002221 Peden, A. E. OCCURRENCE OF THE EELPOUT, *BOTHROCARA PUSILLUM* (ZOARCIDAE), OFF BRITISH COLUMBIA. *Syesis* 12:183-184. 1979. SFA 25(3)
[Mar. Biol. Div., British Columbia Prov. Mus., Victoria, BC V8V 1X4, Canada]

80-002222 Peden, A. E. RARE CAPTURES OF TWO FISHES, *BENTHODESMUS* AND *PARALEPIS*, OFF BRITISH COLUMBIA. *Syesis* 12:179-180. 1979. SFA 25(3)
[Mar. Biol. Div., British Columbia Prov. Mus., Victoria, BC V84 1X4, Canada]

80-002223 Post, A. and A. Svoboda. STRANDFUNDE MESOPELAGISCHER FISCHE AUS DEM GOLF VON AKABA. [ASHORE RECORDS OF MESOPELAGIC FISHES FROM THE GULF OF AQABA.] *Arch. Fischereiwiss.* 30(2-3):137-143. Mar. 1980. In German with English summ. SFA 25(3)
[Inst. Seefisch. Bundesforschungsanst. Fisch., Hamburg, West Germany]

80-002224 Post, A. RESULTS OF THE RESEARCH CRUISES OF FRV "WALTHER HERWIG" TO SOUTH AMERICA. LIV. NEW RECORDS OF EXTREMELY RARE PARALEPIDIDS FROM THE SOUTH ATLANTIC (OSTEICHTHYES, MYCTOPHIFORMES, ALEPISAUROIDEI).

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

80-002224 CONTINUED *Arch. Fischereiwiss.* 30(2-3):121-124. Mar. 1980. In English with German summ. SFA 25(3)
[Inst. Seefisch. Bundesforschungsanst. Fisch., Hamburg, West Germany]

80-002225 Shcherbachev, Yu. N.; Yu. I. Sazonov and A. S. Piotrovskiy. ON THE DISCOVERY OF *TRACHONURUS VILLOSUS* AND SPECIES OF THE GENUS *MESOBIUS* (MACROURIDAE, OSTEICHTHYES) IN THE INDIAN OCEAN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):16-23. 1979. SFA 25(3)
[P. P. Shirshov Inst. Oceanol., USSR Acad. Sci., Moscow, USSR]

80-002226 Stein, D. L. and A. E. Peden. FIRST RECORD OF *PARALIPARIS PAUCIDENS* STEIN (PISCES: LIPARIDAE) FROM BRITISH COLUMBIA WATERS. *Syesis* 12:181. 1979. SFA 25(3)
[Mar. Biol. Div., British Columbia Prov. Mus., Victoria, BC V8V 1X4, Canada]

80-002227 Taylor, T. L. A BLUE CATFISH FROM THE SACRAMENTO-SAN JOAQUIN DELTA. *Calif. Fish Game* 66(2):120-121. Apr. 1980. SFA 25(3)
[Calif. Dep. Fish Game, 4001 N. Wilson Way, Stockton 95205]

80-002228 Tsepkin, Ye. A. LATE QUATERNARY ICHTHYOFAUNA OF THE ALDAN RIVER (LENA BASIN). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):23-27. 1979. SFA 25(3)
[Dep. Ichthyol., Univ. Moscow, USSR] The species composition of fish inhabiting the middle reaches of Aldan River at the end of the Pleistocene-Holocene is determined and their size reconstructed from fossil remains from the Dyuktay cave. Fishes of the same species and of similar size as present-day fishes inhabited the Aldan River in the late Pleistocene.

80-002229 U.S. Fish and Wildlife Service. SELECTED VERTEBRATE ENDANGERED SPECIES OF THE SEACOAST OF THE UNITED STATES. *U.S. Fish Wildl. Serv.* FWS/OBS-80/01. Mar. 1980. SFA 25(3)
[D. W. Woodard: U.S. FWS, Natl. Coastal Ecosyst. Team, 1010 Gause Blvd., Slidell, LA 70458]

80-002230 Vinikour, W. S. and R. V. Anderson. FIRST CONFIRMED RECORDS OF FISH (*COTTUS BAIRDI*) FROM TROUT PARK NATURE PRESERVE (ELGIN BOTANICAL GARDENS) SINCE PARK PERTURBATION BY I-90 CONSTRUCTION, 1957. *Trans. Ill. State Acad. Sci.* 72(2):97-99. 1979. SFA 25(3)
[Argonne Natl. Lab., Div. Environ. Impact Stud., Argonne, IL 60439]

80-002231 Wenner, C. A.; C. A. Barans; B. W. Stender and F. H. Berry. RESULTS OF MARMAP OTTER TRAWL INVESTIGATIONS IN THE SOUTH ATLANTIC BIGHT. IV. WINTER-EARLY SPRING 1975. *S.C. Mar. Resour. Cent. Tech. Rep.* No. 44. 59p. Dec. 1979. SFA 25(3)
[S.C. Wildl. Mar. Resour. Dep., Mar. Resour. Res. Inst., Charleston 29412]

80-002232 Zuck, W. H. and R. F. Denoncourt. FISHES OF THE YELLOW BREECHES CREEK BRAINAGE, CUMBERLAND AND YORK COUNTIES, PENNSYLVANIA. *Proc. Pa. Acad. Sci.* 53(2):161-168. 1979. SFA 25(3)
[Biol. Sci. Dep., York Coll. Pa., York, PA 19405]

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY

80-002233 Black, G. THE STATUS OF THE DESERT PUPFISH, *CYPRINODON MACULARIUS*, AT THE SALTON SEA, CALIFORNIA. *Summ. Proc. Annu. Symp. Desert Fish. Counc.* 10:31-32. 30 Jan. 1980. Abstract only. SFA 25(3)
[1644 N. Humboldt Ave., Ontario, CA 91764]

80-002234 Dahlgren, B. T. INFLUENCES OF POPULATION DENSITY ON REPRODUCTIVE OUTPUT AT FOOD EXCESS IN THE GUPPY, *POECILIA RETICULATA* (PETERS). *Biol. Reprod.* 22(5):1047-1061. June 1980. SFA 25(3)
[Dep. Anim. Ecol., Univ. Lund, S-223 62 Lund, Sweden] Experiments were performed to investigate if population density and social facilitation may influence fecundity (number of ova produced per female) and fertility (number of intrafollicular embryos produced by a female) in the presence of excess food in the guppy, *Poecilia reticulata* (Teleostei: Poeciliidae). No significant differences in total body length, standard length and total body weight were found between females exposed to different population densities in the presence of excess food. The frequencies of females with only intrafollicular embryos or with only ova or with both embryos and ova in the ovary were not significantly different between groups at different population levels. This was also true for the frequency of females with only previtellogenic oocytes. There were no significant differences concerning ovarian length, width, height and volume between females from different population densities. This clear-cut result persisted also when gonad weight was examined. The average gonadosomatic index was highest in the highest population density. Highly significant correlations occurred between ovarian volume and total body weight as well as between ovarian volume and gonad weight at each population level ($P<0.001$, $P<0.01$). This was also the case for gonad weight vs total body weight ($P<0.001$, $P<0.01$). A significant and inverse correlation between fecundity and ovum diameter appeared only at the highest population level ($P<0.01$). No significant differences of fecundity and ovum diameter in addition to fertility and embryo size were revealed between different population densities when feeding ad libitum. This result differed from an earlier study in which increased population density caused a decrease in fecundity and fertility under conditions of food scarcity.

80-002235 Hubbs, C. THE SOLUTION TO THE *CYPRINODON BOVINUS* PROBLEM: ERADICATION OF A PUPFISH GENOME. *Summ. Proc. Annu. Symp. Desert Fish. Counc.* 10:9-18. 30 Jan. 1980. SFA 25(3)
[Dep. Zool., Univ. Tex., Austin 78712] The Leon Springs pupfish, *Cyprinodon bovinus*, is restricted to the Leon Creek watershed, Pecos County, Texas. *Cyprinodon variegatus* of unknown provenance released into the creek between January and August, 1974, produced a major hybrid swarm in the lower segment of Leon Creek and threatened the genic purity of the species. The extensive efforts that resulted in the elimination of phenotypic evidence of hybridization are documented.

80-002236 Kirksunov, Ye. A. and M. I. Shatunovskiy. SOME QUESTIONS OF POPULATION STRUCTURE VARIABILITY IN THE SMELT, *OSMERUS EPERLANUS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):48-55. 1979. SFA 25(3)
[Dep. Ichthyol., Moscow Univ., USSR] A study was made of the factors and mechanisms determining the direction of changes in the population structure of the smelt, *Osmerus eperlanus*, during changes in the environment. On the basis of known data on the feeding of smelt in different areas changes are traced in the nature of the energy metabolism in separate forms of this species. The origin and adaptive significance of certain types of population dynamics in the species are explained from the bioenergetic point of view.

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

80-002237 Krokhin, Ye. M. and F. V. Krogius. PERIODIC FLUCTUATIONS IN THE LAKE DAL'NEYE ECOSYSTEM AND THEIR CONNECTION WITH SOLAR ACTIVITY RHYTHMS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):1-7. 1979. SFA 25(3)
[Kamchatka Dep., Pac. Res. Inst. Fish. Oceanogr., Petropavlovsk-Kamchatskiy, USSR] One of the major elements of the Lake Dal'neye ecosystem is the sockeye salmon, *Onchorhynchus nerka* which reproduces in this lake. Long-term observations, making it possible to apply the method of integral curves, have shown a strict correlation between the processes occurring in the ecosystem and in the actual sockeye population and a clear connection between the fluctuations in their abundance and the eleven-year rhythm in the changes of solar activity. This adaptation of the sockeye population to the entire ecosystem must be genetically consolidated.

80-002238 Smith, M. L. EL ESTADO ACTUAL DE *MEGUPSILON APORUS* Y *CYPRINODON ALVAREZI* DE EL POTOSI, NUEVO LEON. [THE STATUS OF *MEGUPSILON APORUS* AND *CYPRINODON ALVAREZI* AT EL POTOSI, NUEVO LEON.] *Summ. Proc. Annu. Symp. Desert Fish. Counc.* 10:24-29. 30 Jan. 1980. In Spanish and English. SFA 25(3)
[Mus. Zool., Univ. Mich., Ann Arbor 48109] The isolated pond and springs at El Potosí, Nuevo León, constitute the only habitat of two unique pupfish species, *Megupsilon aporus* and *Cyprinodon alverezi*, which are now threatened by the effects of groundwater pumping and predation and competition by introduced black bass. The pupfishes have been eliminated from parts of the main pond, but persist in a marginal marsh, lateral springs and irrigation ditches. Though populations were adequate in May, 1978, their restriction to peripheral habitats makes them susceptible to lowered water levels and other results of human activity. The long-term survival of the pupfishes will depend on careful management of their habitat.

80-002239 Ulanowicz, R. E. and T. T. Polgar. INFLUENCES OF ANADROMOUS SPAWNING BEHAVIOR AND OPTIMAL ENVIRONMENTAL CONDITIONS UPON STRIPED BASS (*MORONE SAXATILIS*) YEAR-CLASS SUCCESS. *Can. J. Fish. Aquatic. Sci.* 37(2):143-154. Feb. 1980. In English with French summ. SFA 25(3)
[Univ. Md., Chesapeake Biol. Lab., Solomons 20688]

80-002240 Vanicek, C. D. DECLINE OF THE LAKE GREENHAVEN SACRAMENTO PERCH POPULATION. *Calif. Fish Game* 66(3):178-183. July 1980. SFA 25(3)
[Dep. Biol. Sci., Calif. State Univ., Sacramento 95819] Fish populations at Lake Greenhaven were monitored by fall surveys from 1973 through 1978. The Sacramento perch has undergone a decline in abundance, growth, and condition, and has failed to reproduce in 3 of the last 4 years of the study. Other species, particularly the bluegill, have increased in abundance since 1973. Competitive interference by the bluegill population is suggested as the primary reason for the decline of the Sacramento perch population.

IDENTIFICATION, KEYS, CLASSIFICATION

80-002241 Andriyashev, A. P. and A. V. Neyelov. NEW SPECIES OF THE GENUS *PARALIPARIS* (LIPARIDAE) FROM THE WESTERN ANTARCTIC. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):7-15. 1979. SFA 25(3)
[Inst. Zool., USSR Acad. Sci., Lennigrad, USSR]

80-002242 Bills, F. T. and C. E. Bond. A NEW SUBSPECIES OF TUI CHUB (PISCES: CYPRINIDAE) FROM COWHEAD LAKE, CALIFORNIA. *Copeia* 1980(2):320-322. 1 May 1980. SFA 25(3)

IDENTIFICATION, KEYS, CLASSIFICATION (CONTINUED)

80-002242 CONTINUED
[Dep. Fish. Wildl., Oreg. State Univ., Corvallis 97331] A new subspecies of tui chub from an isolated slough in northeastern California is described. *Gila bicolor vaccaceps*, the Cowhead Lake tui chub, is distinguished by 19 to 25 short gill rakers, by 26 to 35 predorsal scales and a mean value of 15.52 pectoral-fin rays. Although Cowhead Lake once drained into Warner Valley, Oregon, *G. b. vaccaceps* is well-differentiated from the the chub of the latter basin.

80-002243 Bradbury, M. G. A REVISION OF THE FISH GENUS *OGCOCEPHALUS* WITH DESCRIPTONS OF NEW SPECIES FROM THE WESTERN ATLANTIC OCEAN (OGCOCEPHALIDAE; LOPHIIFORMES). *Proc. Calif. Acad. Sci.* 42(7):229-285. 2 July 1980. SFA 25(3)
[Dep. Ichthyol., Calif. Acad. Sci., Golden Gate Park, San Francisco 94118]

80-002244 Clark, E. RED SEA FISHES OF THE FAMILY TRIPTERYGIIDAE WITH DESCRIPTIONS OF EIGHT NEW SPECIES. *Isr. J. Zool.* 28(2/3):65-113. 1979. SFA 25(3)
[Dep. Zool., Univ. Md., College Park 20742]

80-002245 Cohen, D. M. NAMES OF THE HAKES. *Mar. Fish. Rev.* 42(1):2-3 Jan. 1980. SFA 25(3)
[NMFS, Natl. Mus. Nat. Hist., Washington, DC 20560]

80-002246 Fritzsche, R. A. REVISION OF THE EASTERN PACIFIC SYNGNATHIDAE (PISCES: SYNGNATHIFORMES), INCLUDING BOTH RECENT AND FOSSIL FORMS. *Proc. Calif. Acad. Sci.* 42(6):181-227. 2 July 1980. SFA 25(3)
[Dep. Biol., Univ. Miss., University 38677]

80-002247 Gaudant, J. SUR *AMIA KEHRERI* ANDREAE (POISSON AMIIDAE DU LUTÉTIEN DE MESSEL, ALLEMAGNE) ET SA SIGNIFICATION PALÉOGÉOGRAPHIQUE. [ON *AMIA KEHRERI* ANDREAE (AMIID FISH FROM THE LUTETIAN OF MESSEL, GERMANY) AND ITS PALAEOGEOGRAPHICAL SIGNIFICANCE.] *C. R. Seances Acad. Sci. Ser. D Sci. Nat.* 290(16):1107-1110. 28 Apr. 1980. In French with English summ. SFA 25(3)
[17, rue du Docteur-Magnan, 75013 Paris, France]

80-002248 Hardy, G. S. A REDESCRIPTION OF THE ANTITROPICAL PUFFERFISH *AROTHRON FIRMAMENTUM* (PLECTOGNATHI: TETRAODONTIDAE). *N.Z. J. Zool.* 7(1):115-125. 1980. SFA 25(3)
[Sch. Zool., Univ. New South Wales, P.O. Box 1, Kensington, N.S.W. 2033, Australia]

80-002249 Meyer, M. K. and M. Schartl. EINE NEUE *XIPHOPHORUS*-ART AUS VERA CRUZ, MEXIKO. [A NEW *XIPHOPHORUS* SPECIES FROM VERA CRUZ, MEXICO.] *Senckenbergiana Biol.* 60(3/4):147-151. 1980. In German with English summ. SFA 25(3)
[Schwalheimer Hauptstr. 221 D-6350 Bad Nauheim 6, West Germany]

80-002250 Morton, W. M. GOODBYE DOLLY. *Fisheries (Bull. Am. Fish. Soc.)* 5(3):17-21. May-June 1980. SFA 25(3)

IDENTIFICATION, KEYS, CLASSIFICATION (CONTINUED)

80-002251 Parin, N. V. *MELANOSTIGMA (BANDICHTHYS) VITIAZI* - A NEW DEEP-SEA FISH (MELANOSTIGMATIDAE, OSTEICHTHYES) FROM THE BANDA SEA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):150-153. 1979. SFA 25(3)
[P. P. Shirshov Inst. Oceanol., USSR Acad. Sci., Moscow, USSR]

80-002252 Poss, S. G. and W. N. Eschmeyer. *XENAPLOACTIS*, A NEW GENUS FOR *PROSOPODASYS ASPERRIMUS* GÜNTHER (PISCES: APLOACTINIDAE), WITH DESCRIPTIONS OF TWO NEW SPECIES. *Proc. Calif. Acad. Sci.* 42(8):287-293. 2 July 1980. SFA 25(3)
[Div. Biol. Sci., Univ. Mich., Ann Arbor 48109]

80-002253 Randall, J. E. REVISION OF THE FISH GENUS *PLECTRANTHIAS* (SERRANDIDAE: ANTHIINAE) WITH DESCRIPTIONS OF 13 NEW SPECIES. *Micronesica* 16(1):101-187. June 1980. SFA 25(3)
[Bernice P. Bishop Mus., Box 19000-A, Honolulu, HI 96819]

80-002254 Snelson, F. F., Jr. SYSTEMATIC REVIEW OF THE CYPRINID FISH, *NOTROPIS LIRUS*. *Copeia* 1980(2):323-334. 1 May 1980. SFA 25(3)
[Dep. Biol., Univ. Cent. Fla., P.O. Box 25000, Orlando 32816]

80-002255 Staeck, W. *CHROMIDOTILAPIA LINKEI* N. SP. AUS DEM MUNGO RIVER, KAMERUN. [*CHROMIDOTILAPIA LINKEI* N.SP. FROM THE RIVER MUNGO, CAMEROON.] *Senckenbergiana Biol.* 60(3/4):153-157. 1980. In German with English summ. SFA 25(3)
[Beymestr. 8, D-1000, Berlin 41, West Germany]

80-002256 Staeck, W. *PSEUDOTROPHEUS HETEROPICTUS* N.SP. AUS DEM MALAWI-SEE. [*PSEUDOTROPHEUS HETEROPICTUS* N.SP. FROM LAKE MALAWI.] *Senckenbergiana Biol.* 60(3/4):159-162. 1980. In German with English summ. SFA 25(3)
[Beymestr. 8, D-1000, Berlin 41, West Germany]

80-002257 Tokuya, K. and K. Amaoka. [STUDIES ON LARVAL AND JUVENILE BLENNIES IN THE COASTAL WATERS OF THE SOUTHERN HOKKAIDO (PISCES: BLENNIOIDEI).] *Bull. Fac. Fish. Hokkaido Univ.* 31(1):16-49. Mar. 1980. In Japanese with English summ. SFA 25(3)
[Lab. Mar. Zool., Fac. Fish., Hokkaido Univ., Minato-cho, Hakodate 041, Japan]

80-002258 Tortonese, E. ON SOME BUTTERFLY FISHES FROM THE RED SEA (PISCES, CHAETODONTIDAE). *Thalassographica* 3(1):35-42. Nov. 1979. In English with French and Greek summ. SFA 25(3)
[Ist. Zooprof., Genova, Italy]

PARASITES AND DISEASES-GENERAL

80-002259 Arthur, J. R. and H. P. Arai. STUDIES ON THE PARASITES OF PACIFIC HERRING (*CLUPEA HARENGUS PALLASI* VALENCIENNES): A PRELIMINARY EVALUATION OF PARASITES AS INDICATORS OF GEOGRAPHICAL ORIGIN FOR SPAWNING HERRING. *Can. J. Zool.* 58(4):521-527. Apr. 1980. In English with French summ. SFA 25(3)
[Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] A

PARASITES AND DISEASES-GENERAL (CONTINUED)

80-002259 CONTINUED preliminary analysis of parasites as biological indicators for spawning stocks of Pacific herring (*Clupea harengus pallasi* Valenciennes) occurring in coastal waters of British Columbia and adjacent areas of Washington and Alaska was conducted using the techniques of pattern recognition. Separation of stocks based on three parasites which best served as category separators (*Thynnascaris adunca* (Rudolphi, 1802) larva; *Anisakis simplex* (Rudolphi, 1809) larva; and bucephalid metacercariae) using multicategory linear discriminant analysis and *k*-nearest neighbor analysis revealed good separation for only one locality (Port Gamble, Washington). Re-analysis using three subsets of collections based on geographical area (northern, central, and southern) gave substantially improved classification. Although reliable separation of adjacent stocks of spawning herring could not be accomplished, parasites may be useful in characterizing certain stocks of herring or for separation of stocks taken from more divergent geographical areas.

80-002260 Ghittino, P.; P. De Kinkelin and N. Fijan. THE INTERNATIONAL ZOO-SANITARY CODE AND FISH DISEASES. *Riv. It. Piscic. Ittiop.* 15(1):17-26. Jan.-Feb.-Mar. 1980. In English, French and Italian. SFA 25(3)
[Ist. Zooprof. Spec. Piemonte, Via Bologna 148, 10154 Torino, Italy]

80-002261 Liguori, V. M. THE GILL PARASITES OF THE WHITE PERCH, *MORONE AMERICANA*, FROM THE HUDSON RIVER AT VINCENT'S POINT. *M.S. thesis, Adelphi Univ.* 86p. 1979. From Masters Abstr. 18(2):84. June 1980. SFA 25(3)
One hundred and seventy-seven Hudson River white perch, *Morone americana*, were caught between June and November, 1978 and examined for the presence and distribution of gill parasites. Five species were recovered: the monogene *Urocleidus biramosus*; *Ergasilus labricus*, a copepod; *Lampsilis radiata* glochidia; the isopod *Lironeca ovalis*; and the metacercarial cysts of an unidentified trematode. A species of monogene egg was also found. All but the metacercariae followed seasonal patterns with various factors, including host spawning time, salinity changes due to host movement, and water temperature, seeming to take part in the seasonality observed. While an uneven pattern of distribution was observed for all five species, only some patterns were significant. All but the copepods had their greatest incidence on gill section B, while the incidence of all but the monogene was highest on gill arch one. These phenomena appear to be a result of the ventilation current.

80-002262 Pomales, A. D. and E. H. Williams, Jr. YEARLY PARASITE VARIATION IN THE TEMPERATE CENTRARCHID, *MICROPTERUS SALMOIDES* (LACÉPÈDE), LARGEMOUTH BASS, TWENTY-EIGHT YEARS AFTER INTRODUCTION INTO A TROPICAL ENVIRONMENT. *J. Parasitol.* 66(1):81. Feb. 1980. SFA 25(3)
[Dep. Mar. Sci., Univ. Puerto Rico, Mayaguez 00708]

BACTERIAL DISEASES

80-002263 Antipa, R.; R. Gould and D. F. Amend. *VIBRIO ANGUILLARUM* VACCINATION OF SOCKEYE SALMON *ONCORHYNCHUS NERKA* (WALBAUM) BY DIRECT AND HYPEROSMOTIC IMMERSION. *J. Fish Dis.* 3(2):161-165. Mar. 1980. SFA 25(3)
[D. F. Amend: Tavolek Inc., 2779 152nd Ave. N.E., Redmond, WA 98052]

80-002264 Bucke, D. A NOTE ON ACID-ALCOHOL-FAST BACTERIA IN MACKEREL *SCOMBER SCOMBRUS* L. *J. Fish Dis.* 3(2):173-175. Mar. 1980. SFA 25(3)
[Minist. Agric. Fish. Food, Fish Dis. Lab., The Nothe, Weymouth, Dorset DT4 8UB, England]

BACTERIAL DISEASES (CONTINUED)

80-002264 CONTINUED

80-002265 Elliott, D. G. and E. B. Shotts, Jr. AETIOLOGY OF AN ULCERATIVE DISEASE IN GOLDFISH *CARASSIUS AURATUS* (L.): MICROBIOLOGICAL EXAMINATION OF DISEASED FISH FROM SEVEN LOCATIONS. *J. Fish Dis.* 3(2):133-143. Mar. 1980. SFA 25(3)

[Coll. Fish., WH-10, Univ. Wash., Seattle 98195] A comparative diagnostic study was conducted on goldfish, *Carassius auratus* (L.), with a cutaneous ulcerative disease from five locations in the United States and one each in England and Japan. Fish were examined for parasites, viruses and bacteria. Fish from all locations examined were infested by ectoparasites; no single parasite species was common to all locations. No virus-associated cytopathology was observed in fathead minnow (FHM) or adult goldfish (CAR) monolayer cell cultures inoculated with homogenates of cutaneous lesions, kidneys and livers from diseased fish. The only bacterium cultured from fish from all locations was an atypical, often late-pigmenting strain of *Aeromonas salmonicida*. This organism was isolated from 64 of 83 (77%) of the total lesions cultured and was most prevalent in early lesions. A second commonly isolated organism was *Aeromonas hydrophila*, which was cultured from fish at four of the seven locations and from 28 (34%) of the total lesions cultured. *A. hydrophila* was most prevalent in terminal lesions. From these studies it was concluded that *A. salmonicida* was the probable cause of ulcers noted in the cases examined and that *A. hydrophila* was a secondary invader.

80-002266 Elliott, D. G. and E. B. Shotts, Jr. AETIOLOGY OF AN ULCERATIVE DISEASE IN GOLDFISH, *CARASSIUS AURATUS* (L.): EXPERIMENTAL INDUCTION OF THE DISEASE. *J. Fish Dis.* 3(2):145-151. Mar. 1980. SFA 25(3)

[Coll. Fish., WH-10, Univ. Wash., Seattle 98195] Infection experiments were conducted to determine the primary aetiology of an ulcerative disease in goldfish, *Carassius auratus* (L.). Goldfish were exposed to atypical *Aeromonas salmonicida* and *A. hydrophila*, previously isolated from cutaneous ulcers, and to 0.45 µm filtrates of cutaneous ulcers and kidneys from diseased fish. Fish were exposed to each preparation by intraperitoneal, intramuscular or subcutaneous injection and by a method in which a small patch of scales was removed from each side of the fish and the inoculum applied. Most of the fish injected with *A. salmonicida* died without developing cutaneous ulcers; however, ulcers were induced in five of the ten fish exposed by the scale removal technique. Exposure to ultrafiltrates or *A. hydrophila* did not result in consistent ulcer formation or death. Additional experiments showed that a 30-min exposure of goldfish, without prior treatment, to water containing 3 X $10^6$ colony forming units (cfu/ml) of *A. salmonicida* was sufficient to produce cutaneous lesions in nine of ten fish exposed. Multiple lesions were produced in most fish and *A. salmonicida* was consistently recovered. Fish exposed by similar waterborne challenges to 6.2 X $10^6$ cfu/ml of *A. hydrophila* or to 7.2 X $10^6$ cfu/ml of another lesion isolate identified as a member of the *A. hydrophila* complex produced no lesions, even when scales were removed. The studies demonstrate that atypical *A. salmonicida* can initiate cutaneous lesions characteristic of ulcerative disease, while *A. hydrophila* and an *A. hydrophila* complex organism cannot.

80-002267 From, J. CHLORAMINE-T FOR CONTROL OF BACTERIAL GILL DISEASE. *Prog. Fish-Cult.* 42(2):85-86. Apr. 1980. SFA 25(3)

[Danish Trout Cult. Res. Stn., Broens, 6780 Skaerbaek, Denmark]

80-002268 Giavenni, R.; M. Finazzi; G. Poli and E. Grimaldi. TUBERCULOSIS IN MARINE TROPICAL FISHES IN AN AQUARIUM. *J. Wildl. Dis.* 16(2):161-168. Apr. 1980. SFA 25(3)

BACTERIAL DISEASES (CONTINUED)

80-002268 CONTINUED
[Ist. Anat. Patol. Vet. Patol. Aviare, Univ. delgi Stud., Milano, Italy] Skin, gill and visceral tubercle lesions were detected in marine tropical fish in an aquarium. Ninety-seven fish of 17 different genera were affected. The tubercles consisted of a wall of densely packed epithelioid cells and necrotic center packed with acid-fast bacilli identified as *Mycobacterium marinum*.

80-002269 Mikryakov, V. R. AGE-RELATED VARIABILITY IN THE ANTIMICROBIAL EFFECT OF THE BLOOD SERUM OF THE BREAM, *ABRAMIS BRAMA*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):143-149. 1979. SFA 25(3)
[Inst. Biol. Inland Waters, USSR Acad. Sci. Borok, Yaroslavl' Region USSR] The change in the level of the antimicrobial properties of the blood serum was studied in various age groups of the bream *Abramis brama*. The change in these indicators depends on age-related and individual features of the fish. Blood sera suppressed most actively the development of bacteria in fish aged 4+ to 10+; in individuals of more than 11 years old the activity decreased.

80-002270 Mitchell, A. J. and J. A. Plumb. TOXICITY AND EFFICACY OF FURANACE ON CHANNEL CATFISH *ICTALURUS PUNCTATUS* (RAFINESQUE) INFECTED EXPERIMENTALLY WITH *AEROMONAS HYDROPHILA*. *J. Fish Dis.* 3(2):93-99. Mar. 1980. SFA 25(3)
[J. A. Plumb: Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36830] The 96-h medium tolerance limit of Furanace (nifurpirinol; P-7138) for channel catfish *Ictalurus punctatus* at 21°C was 0.94 mg/l. The most effective treatment level for channel catfish, experimentally infected with *Aeromonas hydrophila*, was 3 mg/l for 6.5 h. Furanace at 0.5 and 1.0 mg/l in brain heart infusion agar reduced *in vitro* growth of *A. hydrophila* and at 2.0 mg/l growth was completely inhibited. *In vitro* drug resistance was observed.

80-002271 Pyle, S. W. and E. B. Shotts, Jr. A NEW APPROACH FOR DIFFERENTIATING FLEXIBACTERIA ISOLATED FROM COLD-WATER AND WARMWATER FISH. *Can. J. Fish. Aquatic Sci.* 37(6):1040-1042. June 1980. In English with French summ. SFA 25(3)
[Dep. Med. Microbiol., Coll. Vet. Med., Univ. Ga., Athens 30602]

80-002272 Sanders, J. E. and J. L. Fryer. *RENIBACTERIUM SALMONINARUM* GEN. NOV., SP. NOV., THE CAUSATIVE AGENT OF BACTERIAL KIDNEY DISEASE IN SALMONID FISHES. *Int. J. Syst. Bacteriol.* 30(2):496-502. Apr. 1980. SFA 25(3)
[Dep. Microbiol., Oreg. State Univ., Corvallis 97331] Isolates of the kidney disease bacterium, the causative agent of bacterial kidney disease in salmonid fishes, were characterized by the guanine plus cytosine content of the deoxyribonucleic acid, by cell wall sugar composition, and by amino acid composition of the peptidoglycan cell wall layer. The guanine plus cytosine contents of the deoxyribonucleic acids of the isolates were 53 ± 0.46 mol%. Glucose was the principal cell wall sugar detected in each kidney disease bacterium isolate. The major amino acids detected were alanine, glutamic acid, lysine, and glycine. It is proposed that these organisms form a single species belonging to a new genus, for which the name *Renibacterium* is proposed. The type species is *Renibacterium salmoninarum* sp. nov., of which the type strain is Lea-1-74 (= ATCC 33209). This organism is most closely related to the Coryneform Group of Bacteria.

80-002273 Shotts, E. B., Jr.; F. D. Talkington; D. G. Elliott and D. H. McCarthy. AETIOLOGY OF AN ULCERATIVE DISEASE IN GOLDFISH, *CARASSIUS AURATUS* (L.): CHARACTERIZATION OF THE CAUSATIVE AGENT. *J. Fish. Dis.*

BACTERIAL DISEASES (CONTINUED)

80-002273 CONTINUED 3(3):181-186. May 1980. SFA 25(3)
[Coll. Vet. Med., Univ. Ga., Athens] A bacterium resembling *Aeromonas salmonicida* and determined to be the aetiologic agent of a cutaneous ulcerative disease in goldfish *Carassius auratus* (L.) was further characterized in this study. Forty-five isolates of the bacterium (43 from the United States and one each from England and Japan) were compared with typical salmonid isolates of *A. salmonicida* using biochemical tests, antibiotic sensitivity tests, DNA base composition (moles % guanine plus cytosine) and DNA homolgy. The bacteriological properties of all the goldfish isolates were similar and consistent with those of some atypical *A. salmonicida* previously described. Several important biochemical characteristics distinguished the goldfish isolates from typical *A. salmonicida*, but the DNA binding experiments indicated a high degree of relatedness between the goldfish isolates and typical *A. salmonicida* strains.

PROTOZOAN DISEASES

80-002274 Farley, D. G. and R. Heckmann. ATTEMPTS TO CONTROL *ICHTHYOPHTHIRUS MULTIFILIIS* FOUQUET (CHILIOPHORA: OPHRYOGLENIDAE) BY CHEMOTHERAPY AND ELECTROTHERAPY. *J. Fish. Dis.* 3(3):203-212. May 1980. SFA 25(3)
[Dep. Zool., Brigham Young Univ., Provo, UT] New methods were studied for the control of *Ichthyophthirius multifiliis* Fouquet, one of the most serious parasites of fish. Totals of 272 fish, *I. multifiliis* trophozoites and 562,500 tomites were used in the screening of amprolium, ronidizole, and silver nitrate for parasite control. In addition, 1,465 trophozoites and 600 tomites were subjected to pulsed DC electrotherapy trials. Silver nitrate at 0.67 ppm was 100% effective in eradicating tomites, while ronidizole at 750 ppm gave 100% and 97% control of trophozoites and tomites, respectively. Amprolium and electrotherapy were both ineffective against trophozoites and tomites. Silver nitrate has promise as a safe and effective alternative to chemicals currently used to control *I. multifiliis*.

80-002275 Kirmse, P. OBSERVATIONS ON THE PATHOGENICITY OF *HAEMOGREGARINA SACHAI* KIRMSE, 1978, IN FARMED TURBOT *SCOPHTHALMUS MAXIMUS* (L.). *J. Fish Dis.* 3(2):101-114. Mar. 1980. SFA 25(3)
[Unit Aquatic Pathobiol., Univ. Stirling, Stirling FK9 4LA, Scotland] Cultured turbot *Scophthalmus maximus* (L.) from three farms at Hunterston, Scotland were found to be infected with *Haemogregarina sachai*. Up to 6% of some populations were affected with gross tumorous lesions of the musculature and viscera. The lesions consisted of necrotic tissue with a caseous centre. Histologically, there was an accumulation of parasitized reticulo-endothelial cells, cell debris and pyknotic nuclei. Parasitaemias of up to 36% of all blood cell types were observed. The majority of infected cells were neutrophils and monocytes. Infected leucocytes were hypertrophied. There was an erythrocytopenia of infected fish with increases in erythroblasts, monocytes and neutrophils but a decrease in thrombocytes and lymphocytes. Transmission experiments between fish were unsuccessful.

80-002276 Kozel, T. R.; M. Lott and R. Taylor. ISOLATION OF *MYXOSOMA CEREBRALIS* (WHIRLING DISEASE) SPORES FROM INFECTED FISH BY USE OF A PHYSICAL SEPARATION TECHNIQUE. *Can. J. Fish. Aquatic Sci.* 37(6):1032-1035. June 1980. In English with French summ. SFA 25(3)
[Dep. Microbiol., Univ. Nev., Reno 89557]

PROTOZOAN DISEASES (CONTINUED)

80-002277 MacLean, S. A. STUDY OF *HAEMATRACTIDIUM SCOMBRI* IN ATLANTIC MACKEREL, *SCOMBER SCOMBRUS*. *Can. J. Fish. Aquatic Sci.* 37(5):812-816. May 1980. In English with French summ. SFA 25(3)
[NMFS, Oxford, MD 21654]

80-002278 Mitchell, L. G.; J. K. Listebarger and W. C. Bailey. EPIZOOTIOLOGY AND HISTOPATHOLOGY OF *CHLOROMYXUM TRIJUGUM* (MYXOSPORA: MYXOSPORIDA) IN CENTRARCHID FISHES FROM IOWA. *J. Wildl. Dis.* 16(2):233-236. Apr. 1980. SFA 25(3)
[Dep. Zool., Iowa State Univ., Ames 50011] The gall bladder parasite, *Chloromyxum trijugum*, shows marked host specificity within the sunfish family Centrarchidae. During 1977-78 80% of 230 bluegills (*Lepomis macrochirus*) in Iowa were infected. Prevalence in green sunfish (*L. cyanellus*) was lower (17%); one of 2 specimens of the hybrid *L. macrochirus* X *L. cyanellus* was infected; orangespotted sunfish (L. humilis) and hybrids (*L. humilis* X *L. macrochirus*) were not infected. Intensity of infection in bluegills varied throughout the year. Prevalence of free-floating plasmodia in bluegill gall bladders was highest (100%) during winter and spring months, and decreased to 40-50% during summer and fall. Prevalence of attached plasmodia may remain 80-100% throughout the year. Sporulation and plasmotomy were observed year-round. Plasmodia were attached to underlying epithelial cells by pseudopodia-like projections and were associated with various stages of breakdown in the mucosal layer.

80-002279 Seagrave, C. P.; D. Bucke and D. J. Alderman. ULTRASTRUCTURE OF A HAPLOSPOREAN-LIKE ORGANISM: THE POSSIBLE CAUSATIVE AGENT OF PROLIFERATIVE KIDNEY DISEASE IN RAINBOW TROUT. *J. Fish Biol.* 16(4):453-459. Apr. 1980. SFA 25(3)
[Fish Dis. Lab., Weymouth, Dorset, England]

80-002280 Siau, Y. OBSERVATION IMMUNOLOGIQUE SUR DES POISSONS DU GENRE *MUGIL* PARASITES PAR LA MYXOSPORIDIE *MYXOBOLUS EXIGUUS* THÉLOHAN, 1895. [IMMUNOLOGIC OBSERVATIONS IN FISHES OF THE GENUS *MUGIL* PARASITIZED BY THE MYXOSPORIDAN *MYXOBOLUS EXIGUUS* THÉLOHAN, 1895.] *Z. Parasitenkd.* 62(1):1-6. 1980. In French with English summ. SFA 25(3)
[Lab. Ichthyol. Parasitol. Gen., Univ. Sci. Tech. Lang., Place E. Bataillon, F-34060 Montpellier, France]

80-002281 Siau, Y. OBSERVATION IMMUNOLOGIQUE SUR DES POISSONS DU GENRE *MUGIL* PARASITES PAR LA MYXOSPORIDIE *MYXOBOLUS EIGUUS* THÉLOHAN, 1895. [IMMUNOLOGIC OBSERVATIONS IN FISHES OF THE GENUS *MUGIL* PARASITIZED BY THE MYXOSPORIDAN *MYXOBOLUS EXIGUUS* THÉLOHAN, 1895.] *Z. Parasitenkd.* 62(1):1-6. 1980. In French with English summ. SFA 25(3)
[Lab. Ichthyol. Parasitol. Gen., Univ. Sci. Tech. Lang., Place E. Bataillon, F34060 Montpellier, France]

80-002282 Smith, C. E. and T. Inslee. INTERLAMELLAR *HENNEGUYA* INFESTATION IN ADULT CHANNEL CATFISH *ICTALURUS PUNCTATUS* (RAFINESQUE). *J. Fish. Dis.* 3(3):257-260. May 1980. SFA 25(3)
[U.S. FWS, Fish Cult. Dev. Cent., Bozeman, MT 59715]

80-002283 Wehnert, S. D. and P. T. K. Woo. *IN VIVO* AND *IN VITRO* STUDIES ON THE HOST SPECIFICITY OF *TRYPANOPLASMA SALMOSITICA*. *J. Wildl. Dis.* 16(2):183-187. Apr. 1980. SFA 25(3)

PROTOZOAN DISEASES (CONTINUED)

80-002283 CONTINUED
[P. T. K. Woo: Dep. Zool., Univ. Guelph, Guelph, ON, Canada] The host specificity of *Trypanoplasma salmositica* was studied by experimental inoculation into 13 species of common teleosts (*Notropis cornutus, Notropis heterolepis, Notropis spilopterus, Nocomis biguttatus, Rhinichthys atratulus, Semotilus atromaculatus, Carassius auratus, Ambloplites rupestris, Lepomis gibbosus, Etheostoma nigrum, Hypentelium nigricans, Ictalurus melas,* and *Eucalia inconstans*). *T. salmositica* was not recovered at 14 and 40 days post inoculation. However, large numbers of the parasite were recovered from *Salmo gairdneri* and *Cottus cognatus*, thus indicating that sculpins might be reservoir hosts in certain areas where salmonids and sculpins occur in close proximity. Using a modified *In Vitro* Plasma Incubation Technique, it was shown that the plasma of refractory fishes had lytic ability and the titer ranged from 1:4 to 1:8. Undiluted fresh plasma of goldfish and of the northern hog sucker lysed about 500 parasites within 30 to 60 mins at 4C. This lytic ability of fresh plasma was heat labile and partial coagulation of the blood also reduced the lytic liter. This study showed that *Trypanoplasma salmositica* was more host specific than originally reported. It was suggested that the mechanism responsible for providing the innate immunity to this parasite in some fishes was the Alternate Pathway of Complement Activation.

VIRAL DISEASES

80-002284 Agrawal, N. K. and C. L. Mahajan. NUTRITIONAL DEFICIENCY DISEASE IN AN INDIAN MAJOR CARP, *CIRRHINA MRIGALA* HAMILTON, DUE TO AVITAMINOSIS C DURING EARLY GROWTH. *J. Fish. Dis.* 3(3):231-248. May 1980. SFA 25(3)
[Aquatic Fish Biol. Lab., Dep. Zool., Univ. Rajasthan, Jaipur, India] Experiments with a purified vitamin test diet on newly hatched *Cirrhina mrigala* Hamilton, a major carp of great piscicultural importance, are reported. Experimentally induced vitamin C deficiency for 330 days was followed by recovery treatment for 30 days. Retarded growth and greater mortality accompanied by structural deformities such as lordosis and scoliosis, increasing with prolonged deficiency, were recorded. Haematological and haematopoietic studies revealed hypochromic macrocytic anaemia accompanied by anisocytosis. Correlated studies on erythropoiesis revealed increased reticulocytes and an overall decrease in small lymphoid haemoblasts. Total and differential leucocyte counts revealed leucopenia and thrombopenia accompanied by an increase in neutrophils and eosinophils. Recovery treatment halted and in some cases even compensated these pathophysiological changes to some extent.

80-002285 Bowser, P. R. and J. A. Plumb. GROWTH RATES OF A NEW CELL LINE FROM CHANNEL CATFISH OVARY AND CHANNEL CATFISH VIRUS REPLICATION AT DIFFERENT TEMPERATURES. *Can. J. Fish. Aquatic Sci.* 37(5):871-873. May 1980. In English with French summ. SFA 25(3)
[Univ. Calif., Bodega Mar. Lab., Bodega Bay 94923]

80-002286 MacMillan, J. R. and D. Mulcahy. VIRAL ERYTHROCYTIC NECROSIS: SOME PHYSIOLOGICAL CONSEQUENCES OF INFECTION IN CHUM SALMON (*ONCORHYNCHUS KETA*). *Can. J. Fish. Aquatic Sci.* 37(5):799-804. May 1980. In English with French summ. SFA 25(3)
[Natl. Fish. Res. Cent., Bldg. 204, NSA, Seattle, WA 98115]

VIRAL DISEASES (CONTINUED)

80-002287 Meyers, T. R. EXPERIMENTAL PATHOGENICITY OF REOVIRUS $13P_2$ FOR JUVENILE AMERICAN OYSTERS *CRASSOSTREA VIRGINICA* (GMELIN) AND BLUEGILL FINGERLINGS *LEPOMIS MACROCHIRUS* (RAFINESQUE). *J. Fish. Dis.* 3(3):187-201. May 1980. SFA 25(3)
[Dep. Avian Aquatic Anim. Med., N.Y. State Coll. Vet. Med., Cornell Univ., Ithaca]

80-002288 Paperna, I.; J. G. Harrison and G. W. Kissil. PATHOLOGY AND HISTOPATHOLOGY OF A SYSTEMIC GRANULOMA IN *SPARUS AURATA* (L.) CULTURED IN THE GULF OF AQABA. *J. Fish. Dis.* 3(3):213-221. May 1980. SFA 25(3)
[J. G. Harrison: MRCVS, Irest. Aquacult., Univ. Stirling, Stirling FK9 4LA, Scotland] A chronic inflammatory disease which has occurred amongst cultured *Sparus aurata* (L.) in Israel is described. The early pathological process is localized in the trunk kidney with focal necrosis, degenerative changes and obstruction of uriniferous ducts by calculi containing tyrosine. Subsequent granuloma formation leads to hypertrophy of the kidney and spleen and inflammatory and necrotic lesions may also be found in liver, gut wall, mesenteries, heart, eyes and other tissues. The diseases represents a significant cause of losses amongst cultured *S. aurata*.

OTHER DISEASES AND PARASITES

80-002289 Ahmed, A. T. A. and S. Egusa. DERMAL FIBROSARCOMA IN GOLDFISH *CARASSIUS AURATUS* (L.). *J. Fish. Dis.* 3(3):249-254. May 1980. SFA 25(3)
[Dep. Zool., Univ. Dacca, Bangladesh]

80-002290 Beverley-Burton, M. and D. M. Suriano. *CLEIDODISCUS ROBUSTUS* MUELLER, 1934 (MONOGENEA: ANCYROCEPHALINAE) FROM *LEPOMIS GIBBOSUS* L. (PISCES: CENTRARCHIDAE) IN ONTARIO, CANADA: ANATOMY AND SYSTEMATIC POSITION. *Can. J. Zool.* 58(4):654-660. Apr. 1980. In English with French summ. SFA 25(3)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

80-002291 Beverley-Burton, M. and D. M. Suriano. *HAPLOCLEIDUS DISPAR* (MUELLER, 1936) AND *PTEROCLEIDUS ACER* (MUELLER, 1936) (MONOGENEA: ANCYROCEPHALINAE) FROM *LEPOMIS GIBBOSUS* L. (PISCES: CENTRARCHIDAE) IN ONTARIO, CANADA: ANATOMY AND SYSTEMATIC POSITION. *Can. J. Zool.* 58(4):661-669. Apr. 1980. In English with French summ. SFA 25(3)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

80-002292 Bilqees, F. M. DESCRIPTION OF THREE TREMATODES INCLUDING TWO NEW SPECIES FROM THE FISHES OF KALRI LAKE, SIND, PAKISTAN. *Pak. J. Sci. Res.* 31(3-4):220-222. 1979. SFA 25(3)
[Sch. Parasitol., Dep. Zool., Univ. Karachi, Karachi-32, Pakistan]

80-002293 Bilquees, F. M. THREE TREMATODES INCLUDING TWO NEW SPECIES FROM FISHES OF THE KARACHI COAST. *Zool Scr.* 9(2):89-91. 1980. SFA 25(3)
[Sch. Parasitol., Dep. Zool., Univ. Karachi, Karachi, Pakistan]

80-002294 Burn, P. R. DENSITY DEPENDENT REGULATION OF A FISH TREMATODE POPULATION. *J. Parasitol.* 66(1):173-174. Feb. 1980. SFA 25(3)
[Osborn Lab. Mar. Sci., N.Y. Aquarium, N.Y. Zool. Soc., Boardwalk at W. 8th St., Brooklyn 11224]

OTHER DISEASES AND PARASITES (CONTINUED)

80-002295 Camp, J. W., Jr. and H. W. Huizinga. SEASONAL POPULATION INTERACTIONS OF *ACANTHOCEPHALUS DIRUS* (VAN CLEAVE 1931) IN THE CREEK CHUB, *SEMOTILUS ATROMACULATUS*, AND ISOPOD, *ASELLUS INTERMEDIUS*. *J. Parasitol.* 66(2):299-304. Apr. 1980. SFA 25(3)
[Dep. Biol., Wake Forest Univ., Winston-Salem, NC 27109]

80-002296 Canning, E. U. and A. C. Olson, Jr. *NOSEMA LEPOCREADII* SP. N., A PARASITE OF *LEPOCREADIUM MANTERI* (DIGENEA: LEPOCREADIIDAE) FROM THE GUT OF THE CALIFORNIA GRUNION, *LEURESTHES TENUIS*. *J. Parasitol.* 66(1):154-159. Feb. 1980. SFA 25(3)
[Dep. Zool., Imperial Coll., London SW7 2AZ, England]

80-002297 Carvajal G., J. and R. A. Campbell. IDENTIFICACIÓN DE LAS LARVAS DE CESTODOS TETRARÍNQUIDOS PRESENTES EN LAS MERLUZAS Y CONGRIOS DE PUERTO MONTT, CHILE. [IDENTIFICATION OF TRYPANORHYNCH PLEROCERCI PRESENT IN HAKES AND REDFISH CUSK-EELS FROM PUERTO MONTT, CHILE.] *Bol. Chil. Parasitol.* 34(3-4):65-67. 1979. In Spanish with English summ. SFA 25(3)
[Lab. Zool., Inst. Cienc. Biol., Univ. Catól. Chile, Casilla 114-D, Santiago, Chile]

80-002298 Cloutman, D. G. TWO NEW SPECIES OF *DACTYLOGYRUS* (MONOGENEA: DACTYLOGYRIDAE) FROM *NOTROPIS SCABRICEPS* (COPE) AND *N. SCEPTICUS* (JORDAN AND GILBERT) (PISCES: CYPRINIDAE). *J. Parasitol.* 66(1):160-161. Feb. 1980. SFA 25(3)
[Duke Power Co. Environ. Lab., Rt. 4, Box 531, Huntersville, NC 28078]

80-002299 Cone, P. K. THE MONOGENEA OF SOME FRESHWATER FISHES IN NEW BRUNSWICK, CANADA. *J. Parasitol.* 66(1):178-180. Feb. 1980. SFA 25(3)
[Dep. Biol., Univ. New Brunswick, Fredericton, NB E3B 5A3, Canada]

80-002300 Crosby, M. D. and K. Smith. SEASONAL INCIDENCE OF *PHILOMETRA* SP. AND OTHER INTERNAL HELMINTHS IN BLUEGILL (*LEPOMIS MACROCHIRUS*) FROM LAKE CARROLL. *Ga. J. Sci.* 38(2):88. Apr. 1980. Abstract only. SFA 25(3)
[West Ga. Coll., Carrollton] During summer (1978) and fall (1979) *Lepomis macrochirus*, the bluegill sunfish, was collected from Lake Carroll, Carrollton, Georgia and examined for internal helminths. The parasitic burden for the fall collection was as follows: digenetic trematodes; *Posthodiplostomum minimum* (metacercaria), mean 7.2, range 0 to 33; nematodes: *Philometra* sp., mean 3.5, range 0 to 19; *Camallanus oxycephalus*, mean 0.3, range 0 to 10; cestodes, mean 0.7, range 0 to 7. The total worm burden for the fall (mean of 12.0) was approximately one-half that of the summer (mean of 22.4). *P. minimum* showed a decrease from a mean of 12.5 for the summer to a mean of 7.2 for the the fall. Bluegills were not parasitized by *Philometra* sp. during the summer, yet in the fall 5 fish were infected. During the summer, *C. oxycephalus* was prevalent (mean of 7.4), but seems to disappear by the fall. The data suggest a seasonal flux for certain internal helminths.

80-002301 Davies, A. J. SOME OBSERVATIONS ON *HAEMOHORMIDIUM COTTI* HENRY 1910, FROM THE MARINE FISH *COTTUS BUBALIS* EUPHRASEN. *Z. Parasitenkd.* 62(1):31-38. 1980. SFA 25(3)
[Dep. Zool., Univ. Coll. Wales, Aberiptwyth, SY23 3DA, Wales] *Haemohormidium cotti*, an organism of uncertain status, is redescribed from one of its type hosts, the marine fish, *Cottus bubalis*. The parasite

OTHER DISEASES AND PARASITES (CONTINUED)

80-002301 CONTINUED occurs as irregularly round, oval, or elongate, intraerythrocytic bodies within blood and tissue preparations. Electron micrographs show features which suggest that *H. cotti* may, as previously suspected, belong with the Piroplasmasida but no firm evidence of this is established. Possible division stages are identified in both light and electron micrographs. The taxonomic position of *Haemohormidium* is discussed.

80-002302 Davies, A. J. SOME OBSERVATIONS ON *HAEMOHORMIDIUM COTTI* HENRY 1910, FROM THE MARINE FISH *COTTUS BUBALIS* EUPHRASEN. *Z. Parasitenkd.* 62(1):31-38. 1980. SFA 25(3)
[Dep. Zool., Univ. Coll. Wales, Aberystwyth, SY23 3DA, Wales] *Haemohormidium cotti*, an organism of uncertain status, is redescribed from one of its type hosts, the marine fish, *Cottus bubalis*. The parasite occurs as irregularly round, oval, or elongate, intraerythrocytic bodies within blood and tissue preparations. Electron micrographs show features which suggest that *H. cotti* may, as previously suspected, belong with the Piroplasmasida but no firm evidence of this is established. Possible division stages are identified in both light and electron micrographs. The taxonomic position of *Haemohormidium* is discussed.

80-002303 Delves-Broughton, J.; J. K. Fawell and D. Woods. THE FIRST OCCURRENCE OF 'CAULIFLOWER DISEASE' OF EELS *ANGUILLA ANGUILLA* L. IN THE BRITISH ISLES. *J. Fish. Dis.* 3(3):255-256. May 1980. SFA 25(3)
[RHM Research Ltd., High Wycombe, Buckinghamshire, England]

80-002304 Dowsett, J. A. *CLINOSTOMUM COMPLANATUM* OR *CLINOSTOMUM MARINGATUM*? (TREMATODA: CLINOSTOMATIDAE). A PROBLEM OF PRIORITY AND SYNONYMY. *Can. J. Zool.* 58(4):680-682. Apr. 1980. In English with French summ. SFA 25(3)
[Dep. Biol., Univ. Winnipeg, Winnipeg, MB, Canada]

80-002305 Ferguson, H. W. and D. A. Rice. POST-SPAWNING MORTALITIES IN BROWN TROUT *SALMO TRUTTA* L. *J. Fish Dis.* 3(2):153-160. Mar. 1980. SFA 25(3)
[Dep. Pathol., Ontario Vet. Coll., Univ. Guelph, Guelph, ON N1G 2W1, Canada] An 'oedema syndrome' caused mortality of 55.5% in brood brown trout approximately 2 months after spawning. The pathology and clinical biochemistry of the condition are described. It is suggested that the severe hypoproteinaemia and anaemia were due mainly to the traditional reduction in feed levels prior to spawning at a time when the water temperatures were abnormally high. It is also suggested, however, that the syndrome would not have occurred if the fish had not developed an aeromonad infection prior to stripping. Concurrent fungal infection and subsequent extremely low water temperatures are also thought to have played a role.

80-002306 Ghittino, P.; E. Beccaria and A. Ferrari. CASO DI ASCITE INFETTIVA DELLA CARPA MODERNAMENTE DIAGNOSTICATO ANCHE IN ITALIA. [COMMENTS ON A CASE REPORT OF CARP INFECTIOUS DROPSY DIAGNOSED IN ITALY ALSO BY MODERN METHODS.] *Riv. It. Piscic. Ittiop.* 15(1):1-4. Jan.-Feb.-Mar. 1980. In Italian with English summ. SFA 25(3)
[Ist. Zooprof. Spec. Piemonte, Via Bologna 148, 10154 Torino, Italy] The authors commented an outbreak of Infectious Dropsy in Carp (IDC) occurred in common carp fingerlings kept in a pond before releasing it into rice fields in Italy. The disease appeared with all the signs of "Acute IDC or Spring Viraemia of Carp, SVC" and the classical *Rhabdovirus carpio* (its identification has been possible with the help kindly provided by N.N. Fijan, Zegreb, YU) has been isolated. In spite of the high occurrence of

OTHER DISEASES AND PARASITES (CONTINUED)

80-002306 CONTINUED IDC in the country, no recognition of this virus was previously demonstrated. The authors preferred to keep the denomination of IDC, instead to split it in SVC and Carp Erythrodermatitis (CE), since in all practical observations performed in Italy the disease appeared unseverable. During spring times, the acute form with dropsical conditions occurs joined with ulcers or boils; later on, the survivors in the infected groups develop typical ulcers. It is realized that fastidious modern diagnostic methods (virological + bacteriological) are right now necessary to provide a scientifical diagnosis of this carp disease which, meanwhile, became well established in the country.

80-002307 Hayunga, E. G. TWO ATYPICAL LESIONS FROM WHITE SUCKERS *CATOSTOMUS COMMERSONI* LACÉPÈDE INFECTED BY CARYOPHYLLID TAPEWORMS. *J. Fish Dis.* 3(2):167-172. Mar. 1980. SFA 25(3)
[Biomed. Res. Inst., Am. Found. Biol. Res., 12111 Parklawn Dr., Rockville, MD 20852]

80-002308 Keith, J. H. and L. M. Gray. A PRELIMINARY STUDY OF THE OCCURRENCE OF BROKEN BACK SYNDROME IN NORTHERN CAVEFISH (*AMBLYOPSIS SPELAEA* DEKAY) AT SPRING MILL STATE PARK, MITCHELL, INDIANA. *Proc. Indiana Acad. Sci.* 88:163. 1979. Abstract only. SFA 25(3)
[Div. Nat. Preserves, Indiana Dep. Nat. Resour., Indianapolis] In July 1976, the staff of Spring Mill State Park noted that several individuals of Northern Cavefish in Upper Twin Cave were apparently injured. Subsequent examination of the fish by a biologist from the U.S. Fish & Wildlife Service Laboratory in Genoa, Wisconsin indicated that the fish probably suffered from "Broken Back Syndrome", a condition in which vertebrae crack and extensive hemorrhaging results. This syndrome occurs under a variety of circumstances including physical trauma, vitamin C deficiency, and exposure to pesticides. Some preliminary work by the Indiana State Board of Health revealed the presence of toxaphene in the stream water of Upper Twin Cave. Results published by other investigators suggest that exposure of fish to toxaphene and related compounds alters the ratio of coldagen: mineral in the skeleton. Bones become brittle and crack easily, resulting in a broken back and associated hemorrhaging. In the summer of 1977, a similar condition was found. Using funds provided by Indiana's Division of Fish and Wildlife, it was decided to systematically survey the blind fish population and measure the pesticide content (toxaphene and dieldrin) of the stream water on a regular basis. In the summer of 1978, water samples were taken from Upper Twin Cave and analyzed for the presence of pesticides. Samples were taken bi-weekly and during major floods. Five visual censuses of the fish population were implemented to note any changes in the incidence of the syndrome over a two year period. Individual fish were also collected for chemical analysis. A comparison of recent census data from Upper Twin Cave with data taken from the same cave by Poulson (unpublished) in 1958 and 1964 does not demonstrate an adverse impact on the population at this time. However, the water analyses point to the need for further investigation and monitoring of this system. The potential impact of continued pesticide contamination of the cave water will be discussed along with the need for further study.

80-002309 Kranz, H.; N. Peters; G. Bresching and H. F. Stich. ON CELL KINETICS IN SKIN TUMOURS OF THE PACIFIC ENGLISH SOLE *PAROPHRYS VETULUS* GIRARD. *J. Fish Dis.* 3(2):125-132. Mar. 1980. SFA 25(3)
[Zool. Inst. Univ. Hamburg, Martin-Luther-King-Platz 3, 2000 Hamburg 13, West Germany]

OTHER DISEASES AND PARASITES (CONTINUED)

80-002310 Meyers, T. R.; R. E. Millemann and C. A. Fustish. GLOCHIDIOSIS OF SALMONID FISHES. IV. HUMORAL AND TISSUE RESPONSES OF COHO AND CHINOOK SALMON TO EXPERIMENTAL INFECTION WITH *MARGARITIFERA MARGARITIFERA* (L.) (PELECYPODA: MARGARITANIDAE). *J. Parasitol.* 66(2):274-281. Apr. 1980. SFA 25(3)
[Dep. Avian Aquatic Anim. Med., N.Y. State Coll. Vet. Med., Cornell Univ., Ithaca 14853]

80-002311 Muzzall, P. M. POPULATION BIOLOGY AND HOST-PARASITE RELATIONSHIPS OF *TRIGANODISTOMUM ATTENUATUM* (TREMATODA: LISSORCHIIDAE) INFECTING THE WHITE SUCKER, *CATOSTOMUS COMMERSONI* (LACÉPÈDE). *J. Parasitol.* 66(2):293-298. Apr. 1980. SFA 25(3)
[Dep. Zool., Univ. N.H., Durham 03824]

80-002312 Muzzall, P. M. ECOLOGY AND SEASONAL ABUNDANCE OF THREE ACANTHOCEPHALAN SPECIES INFECTING WHITE SUCKERS IN SE NEW HAMPSHIRE. *J. Parasitol.* 66(1):127-133. Feb. 1980. SFA 25(3)
[Dep. Nat. Sci., Kedzie Lab., Mich. State Univ., East Lansing 48824]

80-002313 Narasimhamurti, C.; C. Kalavati and B. Saratchandra. *MYXOSOMA MICROSPORA* N. SP. (MYXOSPORIDIA: PROTOZOA) PARASITIC IN THE GILLS OF *MUGIL CEPHALUS* L. *J. Fish Biol.* 16(4):345-348. Apr. 1980. SFA 25(3)
[Dep. Zool., Andhra Univ., Waltair, India]

80-002314 Pierce, K. V.; B. B. McCain and S. R. Wellings. HISTOPATHOLOGY OF ABNORMAL LIVERS AND OTHER ORGANS OF STARRY FLOUNDER *PLATICHTHYS STELLATUS* (PALLAS) FROM THE ESTUARY OF THE DUWAMISH RIVER, SEATTLE, WASHINGTON, U.S.A. *J. Fish Dis.* 3(2):81-91. Mar. 1980. SFA 25(3)
[B. B. McCain: Environ. Conserv. Div., NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112] Starry flounder *Platichthys stellatus* (Pallas) from the Duwamish River estuary, which has received large volumes of pollutants in the past, and starry flounder from two relatively unpolluted reference areas were examined for pathological conditions. Gross and microscopic examination of starry flounders from the Duwamish River estuary revealed one or more of the following unusual liver characteristics in 92% (monthly range 85-100%) of the fish: liver discolouration, liver enlargement, severe fatty vacuolation of the hepatocytes, centrolobular cellular degeneration and necrosis of hepatocytes, megalocytic hepatocytes, proliferating perivascular fibroblasts displacing adjacent liver parenchyma, hepatic structural disarray and increased basophilia of hepatocytes in localized areas. Livers of starry flounders, usually spent spawners, from one of the reference areas also had one or more of these characteristics, although at a much lower frequency (<13%), and these included liver discolouration, increased fatty vacuolation of the hepatocytes and hepatic structural disarray.

80-002315 Rosen, R. A. and D. C. Hales. OCCURRENCE OF SCARRED PADDLEFISH IN THE MISSOURI RIVER, SOUTH DAKOTA-NEBRASKA. *Prog. Fish-Cult.* 42(2):82-85. Apr. 1980. SFA 25(3)
[Mass. Coop. Fish. Res. Unit, Univ. Mass., Amherst 01003]

80-002316 Sharma, R. K. and P. K. Sharma. A NEW NEMATODE *NEOCAMALLANUS BAREILLIENSIS* FROM A PISCINE HOST *CHANNA PUNCTATUS* BLOCH. *J. Helminthol.* 54(1):21-23. Mar. 1980. SFA 25(3)
[Dep. Zool., Bareilly Coll., Bareilly, U.P., India]

OTHER DISEASES AND PARASITES (CONTINUED)

80-002317 Soto M., J. and J. Carvajal G. PARÁSITOS CESTODOS DE ALGUNOS PECES COMERCIALES DE ANTOFAGASTA, CHILE. [CESTODE PARASITES IN SOME COMMERCIAL FISHES FROM ANTOFAGASTA, CHILE.] *Bol. Chil. Parasitol.* 34(3-4):67-71. 1979. SFA 25(3)
[Grupo Microbiol. Parasitol., Dep. Salud, Univ. Chile, Sede Antofagasta, Casilla 1240, Antofagasta, Chile]

80-002318 Wabuke-Bunoti, M. A. N. THE PREVALENCE AND PATHOLOGY OF THE CESTODE *POLYONCHOBOTHRIUM CLARIAS* (WOODLAND, 1925) IN THE TELEOST, *CLARIAS MOSSAMBICUS* (PETERS). *J. Fish. Dis.* 3(3):223-230. May 1980. SFA 25(3)
[Dep. Genet., Univ. Minn., St. Paul 55108] The prevalence and pathology of the pseudophyllidean cestode, *Polyonchobothrium clarias* in the gastrointestinal tract of the teleost, *Clarias mossambicus* have been studied. The cestodes were most abundant in the gall bladder where they caused pronounced nodular outgrowths in the mucosa and exhibited a gradual decrease in number distally towards the rectum. Generally the intensity of the infection due to *P. clarias* was higher in young fish than in old fish.

POLLUTION

80-002319 Brush, E. J.; M. Kalinowski and T. L. Miller. HEAVY METALS IN A STRETCH OF THE SUSQUEHANNA RIVER BADLY POLLUTED WITH ACID MINE EFFLUENTS. *Proc. Pa. Acad. Sci.* 53(2):179-188. 1979. SFA 25(3)
[Dep. Chem., King's Coll., Wilkes-Barre, PA 18711]

80-002320 Burton, D. T.; S. L. Margrey and L. W. Hall, Jr. SEASONAL EFFECTS OF ONCE-THROUGH POWER PLANT CHLORINATION ON SEVERAL ESTUARINE MACROINVERTEBRATES. *ABS (Assoc. Southeast. Biol.) Bull.* 27(2):26. Apr. 1980. SFA 25(3)
[Benedict Estuarine Lab., Benedict, MD]

80-002321 Eisenberg, M.; R. Mallman; and H. S. Tubiash. POLYCHLORINATED BIPHENYLS IN FISH AND SHELLFISH OF THE CHESAPEAKE BAY. *Mar. Fish. Rev.* 42(2):21-25. Feb. 1980. SFA 25(3)
[Environ. Health Admin., Md. Dep. Health Mental Hygiene, Baltimore 21201]

80-002322 Euston, E. T. and D. Mathur. EFFECTS OF HEATED DISCHARGES ON THE WINTER FISHERY IN CONOWINGO POND, PENNSYLVANIA. *Proc. Pa. Acad. Sci.* 53(2):156-160. 1979. SFA 25(3)
[Radiation Management Corp., Muddy Run Ecol. Lab., P.O. Box 10, Drumore, PA 17518] A combination of non-uniform probability and random method was used to survey the winter (December-March) fishery in Conowingo Pond, a 3,644-hectare impoundment on the lower Susquehanna River, Pennsylvania, in 1973 through 1977 in reference to the heated discharge from Peach Bottom Atomic Power Station. Most winter fishing occurred from shore or through the ice and was for white crappie, *Pomoxis annularis* (91% of the catch). Winter harvest of white crappie ranged from 4000 to 16000 kg. Differences in catch per effort (2.74 vs 1.39) between the preoperational (1973-1974) and postoperational (1975-1977) periods were attributable to wide variations in year class strength and recruitment. Due to lack of access little winter angling was observed in the thermal plume. The heated discharge did not affect the established winter fishery for white crappie in coves and creek mouths which is dependent upon the downstream movement of crappie in late fall. However, the fishing season may be extended in

POLLUTION (CONTINUED)

80-002322 CONTINUED the autumn and begin earlier in the spring as a result of the attraction of other game fishes to the heated discharge.

80-002323 Kearns, P. K.; G. J. Atchison and R. J. Vetter. IMPACT OF HEAVY METALS ON THE GROWTH OF YELLOW PERCH (*PERCA FLAVESCENS*) AS MEASURED BY RNA-DNA RATIOS. *Proc. Indiana Acad. Sci.* 88:161-162. 1979. Abstract only. SFA 25(3)

[Biolnucleon. Dep., Purdue Univ., West Lafayette, IN 47907] Yellow perch (*Perca flavescens*) collected from industrially contaminated Palestine Lake were analyzed for cadmium and zinc content by atomic absorption spectrophotometry. Ribonucleic acid-phosphorus, deoxyribonucleic acid-phosphorus content of fish and RNA-DNA ratios were determined in an effort to compare growth of fish from the contaminated area of the lake to the growth of fish from the uncontaminated area of the lake. Of three sampling dates, one revealed significant differences in growth of fish as monitored by length and weight measurements, condition and RNA-DNA ratios between sites. Linear regression analysis of length and weight relationship of fish from the two sites indicated that fish from the uncontaminated area have heavier weights to a given length than fish from the contaminated area of the lake. As body burdens of cadmium increased in yellow perch, condition and RNA-DNA ratio values decreased. Whole body concentrations of zinc had no relationship to condition or RNA-DNA ratios.

80-002324 Leistritz, F. L. and T. A. Hertsgaard. ENVIRONMENTAL, ECONOMIC & SOCIAL IMPACTS OF A COAL GASIFICATION PLANT IN WESTERN NORTH DAKOTA. *N. Dak. Agric. Exp. Stn. Bull.* No. 509. xii + 160p. Feb. 1980. SFA 25(3)

[N. Dak. State Univ., Fargo]

80-002325 Leung, S.-Y. T. THE EFFECT OF IMPOUNDING A RIVER ON THE PESTICIDE CONCENTRATION IN WARMWATER FISH. *Ph.D. dissertation, Iowa State Univ.* 164p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(11):5129. May 1980. SFA 25(3)

Atrazine, alachlor, and bladex concentrations fluctuated seasonally in the dissolved fraction of the Des Moines River water from September, 1977 through November, 1978. These herbicides were not detected in the bottom sediment collected within Saylorville Reservoir and in seven species of fish sampled above, within, and below the reservoir. The herbicides did not accumulate within the reservoir. Organochlorine insecticides dieldrin, heptachlor expoxide, pp'-DDT, pp'-DDE, and pp'-DDD were detected in most fish samples and bottom sediment. Only dieldrin and pp'-DDE were found in both dissolved and suspended fractions of the river water. No discernible insecticide residue pattern was found in the water and fish in regard to time or the year. Classical biomagnification and spatial trend in concentration of insecticides were not noticeable in the fish. However, buildup of organochlorine insecticides within the reservoir has undoubtedly occurred.

80-002326 Lynch, J. A. and E. S. Corbett. ACID PRECIPITATION--A THREAT TO AQUATIC ECOSYSTEMS. *Fisheries (Bull. Am. Fish. Soc.)* 5(3):8-10, 12. May-June 1980. SFA 25(3)

[Pa. State Univ., University Park]

80-002327 Masnik, M. T. and J. H. Wilson. ASSESSMENT OF THE IMPACTS OF THE SALEM AND HOPE CREEK STATIONS ON SHORTNOSE STURGEON, *ACIPENSER BREVIROSTRUM* LESUEUR. *U.S. Nucl. Regul. Environ. Spec. Tech. Rep.* NUREG-0671. xi + 101p. Apr. 1980. SFA 25(3)

[U.S. Nucl. Regul. Comm., Environ. Spec. Br., P-234, Washington, DC 20555] *Acipenser brevirostrum* LeSueur, a federally recognized endangered

POLLUTION (CONTINUED)

80-002327 CONTINUED species, is known from the Delaware River in the vicinity of the Salem and Hope Creek Nuclear Stations. The potential for adverse impact to this species due to the completion of construction and the operation of these stations is assessed. A review of the literature pertaining to the distribution, life history, and tolerance of this species is presented. Both historical records and current status of the shortnose sturgeon population in the Delaware River are discussed. Station systems which could potentially interact with the shortnose sturgeon population are described. An assessment of loss to the population by each system is presented. Based upon the known life history of the species, the operating characteristics of the stations, and the status of the shortnose sturgeon population in the Delaware River, it is concluded that the construction and operation of the Salem and Hope Creek Nuclear Stations will not jeopardize the continued existence of the shortnose sturgeon.

80-002328 Mathur, D.; T. W. Robbins and E. J. Purdy, Jr. ASSESSMENT OF THERMAL DISCHARGES ON ZOOPLANKTON IN CONOWINGO POND, PENNESYLVANIA. *Can. J. Fish. Aquatic Sci.* 37(6):937-944. June 1980. In English with French summ. SFA 25(3)
[Radiation Management Corp., P.O. Box 10, Drumore, PA 17518]

80-002329 Matthews, R. A. SEWAGE EFFECTS IN A SMALL STREAM. *Va. J. Sci.* 30(2):76. 1979. Abstract only. SFA 25(3)
[Cent. Environ. Stud., VPI&SU, Blacksburg, VA 24061] During the winter and early spring of 1978 a study was conducted to evaluate the impact of sewage effluent upon a small stream in southern Indiana. We found the stream to be moderately impacted, sewage effluent representing close to ten percent of the total discharge downstream from the treatment plant outfall. Turbidity, conductivity, ammonia, and soluble reactive phosphorus concentrations increased below the outfall. Dissolved oxygen concentrations demonstrated a typical oxygen sag with recovery. Fish, benthic, and algal diversities were significantly reduced at the site of effluent input; however, both fish and invertebrates recovered downstream.

80-002330 Peňáz, M. FISH CULTURES IN THE AREA OF THE NUCLEAR POWER STATION DUKOVANY AND THEIR PROSPECTS. *Folia Zool.* 29(1):87-96. 1980. In English with Russian summ. SFA 25(3)
[Inst. Vert. Zool., Czechoslovak Acad. Sci., Brno, Czechoslovakia]

80-002331 Phillips, G. R.; T. E. Lenhart and R. W. Gregory. RELATION BETWEEN TROPHIC POSITION AND MERCURY ACCUMULATION AMONG FISHES FROM THE TONGUE RIVER RESERVOIR, MONTANA. *Environ. Res.* 22(1):73-80. June 1980. SFA 25(3)
[Mont. Coop. Fish Res. Unit, Mont. State Univ., Bozeman 59717] Concentrations of total mercury were determined in muscle tissue from northern pike (*Esox lucius*), sauger (*Stizostedion canadense*), walleye (*S. vitreum*), black crappie (*Pomoxis nigromaculatus*), and white crappie (*P. annularis*) collected from the Tongue River Reservoir, Montana, prior to extensive surface coal-mine development in the region. Mercury concentrations in fish flesh increased with fish size and age; larger individuals of all five species exceeded the U.S. Food and Drug Administration's mercury concentration guideline of 0.5 µg/g. The rate of mercury accumulation was faster in the piscivorous species (northern pike, saugers, and walleyes) than in the planktivores (black crappies and white crappies). Differences in mercury uptake rates among the various species appeared to be directly related to the quantity of mercury eaten; results are discussed in relation to published models of mercury accumulation by fishes.

POLLUTION (CONTINUED)

80-002332 Phillips, G. R. and R. W. Gregory. ACCUMULATION OF SELECTED ELEMENTS (AS, CU, HG, PB, SE, ZN) BY NORTHERN PIKE (*ESOX LUCIUS*) REARED IN SURFACE COAL MINE DECANT WATER. *Proc. Mont. Acad. Sci.* 39:44-50. 1980. SFA 25(3)

[Coop. Fish. Res. Unit, Mont. State Univ., Bozeman 59717] The average mercury concentration in northern pike (*Esox lucius*) reared in decant water from a surface coal mine at West Decker, Montana, increased from 0.00 to 0.13 µg Hg/g wet tissue from 5 May to 7 October, 1977. This rate of mercury uptake is only slightly faster than that experienced by northern pike in the Tongue River Reservoir. Pike reared in mine water did not accumulate arsenic, copper, lead, selenium, or zinc. We conclude that coal mining at West Decker is not currently causing the dissolution of harmful concentrations of these elements and that the high concentrations of mercury present in adult northern pike from the Tongue River Reservoir are not attributable to coal mining activity.

80-002333 Plaskett, D. and I. C. Potter. HEAVY METAL CONCENTRATIONS IN THE MUSCLE TISSUE OF 12 SPECIES OF TELEOST FROM COCKBURN SOUND, WESTERN AUSTRALIA. *Aust. J. Mar. Freshwater Res.* 30(5):607-616. Oct. 1979. SFA 25(3)

[Sch. Environ. Life Sci., Murdoch Univ., Murdoch, Western Australia 6153, Australia]

80-002334 Rogers, L.; J. Yopp and E. E. Cook. INDICATED TRENDS OF MERCURY IN AQUATIC AND TERRESTRIAL FOOD CHAINS IN ILLINOIS. *Trans. Ill. State Acad. Sci.* 72(2):56-63. 1979. SFA 25(3)

[Dep. Technol., South. Ill. Univ., Carbondale 62901] Sources of mercury in the State of Illinois, including industrial, municipal, and institutional wastes, consumption of fossil fuels, and natural sources are examined. Historical records of the Illinois Environmental Protection Agency are reviewed for trends of mercury concentrations in Illinois' waters and sediments and for evidence of mercury accumulation in constituent organisms of terrestrial and aquatic food chains. There appears to be no evidence at this time of serious or widespread mercury contamination in Illinois.

80-002335 Ryan, P. M. and H. H. Harvey. GROWTH RESPONSES OF YELLOW PERCH, *PERCA FLAVESCENS* (MITCHILL), TO LAKE ACIDIFICATION IN THE LA CLOCHE MOUNTAIN LAKES OF ONTARIO. *Environ. Biol. Fishes* 5(2):97-108. 22 Apr. 1980. SFA 25(3)

[Dep. Fish Oceans, P.O. Box 5667, St. John's, NF A1C 5X1, Canada]

80-002336 Schumacher, P. D. and J. J. Ney. AVOIDANCE RESPONSE OF RAINBOW TROUT (*SALMO GAIRDNERI*) TO SINGLE-DOSE CHLORINATION IN A POWER PLANT DISCHARGE CANAL. *Water Res.* 14(6):651-655. 1980. SFA 25(3)

[Environ. Dep., Wis. Elec. Power Co., Milwaukee 53201] Rainbow trout (*Salmo gairdneri*) were exposed to 20 min single-dose chlorine additions designed to achieve maximum total residual chlorine (TRC) concentrations of 0.04, 0.2, 0.6, and 1.0 mg/l. First retreats from the chlorine front occurred at 0.05 TRC. Approximately 95% of the fish had moved downstream when TRC reached 0.5 mg/l, well before cumulative time-dose exposure approached lethal limits. Percentage of fish remaining near the discharge decreased linearly as TRC concentration rose, suggesting that a rapid rise in receiving water chlorine level might be beneficial in reducing cumulative time-dose exposure. Rainbow trout demonstrated the initial sensitivity to avoid lethal chlorine exposure, but complete assessment of the utility of the avoidance response must also consider distribution throughout chlorination and the potential for repeated exposure.

POLLUTION (CONTINUED)

80-002337 Sorentino, C. MERCURY IN MARINE AND FRESHWATER FISH OF PAPUA NEW GUINEA. *Aust. J. Mar. Freshwater Res.* 30(5):617-623. Oct. 1979. SFA 25(3)
[Ranger Uranium Mines Pty. Ltd., P.O. Box 693, Chatswood, New South Wales 2067, Australia]

80-002338 Vinikour, W. S.; R. M. Goldstein and R. V. Anderson. BIOCONCENTRATION PATTERNS OF ZINC, COPPER, CADMIUM AND LEAD IN SELECTED FISH SPECIES FROM THE FOX RIVER, ILLINOIS. *Bull. Environ. Contam. Toxicol.* 24(5):727-734. May 1980. SFA 25(3)
[Environ. Impact Stud. Div., Argonne Natl. Lab., Argonne, IL 60439]

FISH KILLS

80-002339 Johnston, C. E. and J. C. Cheverie. REPOPULATION OF A COASTAL STREAM BY BROOK TROUT AND RAINBOW TROUT AFTER ENDOSULFAN POISONING. *Prog. Fish-Cult.* 42(2):107-110. Apr. 1980. SFA 25(3)
[Dep. Biol., Univ. Prince Edward Island, Charlottetown, PE C1A 4P3, Canada]

TOXICOLOGY; BIOASSAYS

80-002340 Arunachalam, S.; K. Jeyalakshmi and S. Aboobucker. TOXIC AND SUBLETHAL EFFECTS OF CARBARYL ON A FRESHWATER CATFISH, *MYSTUS VITTATUS* (BLOCH). *Arch. Environ. Contam. Toxicol.* 9(3):307-316. 1980. SFA 25(3)
[Dep. Zool., Mandurai Kamaraj Univ., P.G. Cent., Arulmigu Palaniandavar Arts Coll., PALNI 624602, Tamil Nadu, India] The effects of carbaryl (1-naphthalenyl methylcarbamate), commonly used in agricultural operations, have been studied with reference to survival, behavior, food intake, growth, and conversion efficiency of the catfish *Mystus vittatus*. At a concentration of 32.5 ppm, carbaryl caused 100% mortality within 24 hr; the 72 hr $LC_{50}$ was 17.5 ppm. At concentrations of 12.5 ppm and below, it caused no mortalities within 72 hr. But such sublethal concentrations accelerated the swimming activity and increased the frequency of opercular beats. The latter response was dose-dependent. These behavioral changes were the immediate response to the toxicant and were indicators of possible stress. A 27-day exposure to sublethal concentrations of carbaryl led to a decrease in feeding rate and growth rate. The latter decreased from 10.15 mg/g/day (freshwater) to 2.84 mg/g/day (12.5 ppm). The reduced growth and conversion efficiency may be due to the expenditure of more energy for the purpose of maintenance. Therefore, the insecticide is considered to be a metabolic stressor.

80-002341 Ashcom, T. L. SERUM CORTISOL AND ELECTROLYTE RESPONSES IN ACID-STRESSED BROOK TROUT (*SALVELINUS FONTINALIS*). *Ph.D. dissertation, Pa. State Univ.* 141p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(11):5150. May 1980. SFA 25(3)

80-002342 Bagnis, R.; S. Chanteau; E. Chungue; J. M. Hurtel; T. Yasumoto and A. Inoue. ORIGINS OF CIGUATERA FISH POISONING: A NEW DINOFLAGELLATE, *GAMBIERDISCUS TOXICUS* ADACHI AND FUKUYO, DEFINITIVELY INVOLVED AS A CAUSAL AGENT. *Toxicon* 18(3):199-208. 1980. SFA 25(3)
[Med. Oceanogr. Univ., Louis Malardé Med. Res. Inst., P.O. Box 30, Papeete Tahiti, French Polynesia]

TOXICOLOGY; BIOASSAYS (CONTINUED)

80-002343 Bengtsson, B.-E. LONG-TERM EFFECTS OF PCB (CLOPHEN A50) ON GROWTH, REPRODUCTION AND SWIMMING PERFORMANCE IN THE MINNOW, *PHOXINUS PHOXINUS*. *Water Res.* 14(6):681-687. 1980. SFA 25(3)

[Natl. Environ. Prot. Bd., Brackish Water Toxicol. Lab., Studsvik, S-611 82 Nyköping, Swedenμ Adult minnows, *Phoxinus phoxinus*, were orally dosed with PCB (Clophen A50) for 40 days and were studied for 300 days for long-term sublethal effects. Clophen A50 was found to have a growth promoting effect and demonstrated several effects on reproduction. Swimming performance, studied by the rotatory-flow technique, was not affected at the concentrations that gave effects on growth and reproduction. The clearance of accumulated PCB from the body was slow.

80-002344 Colquhoun, J. R. and H. J. Dean. TOXICITY OF PROPOXUR TO BROOK TROUT AND LANDLOCKED SALMON. *N.Y. Fish Game J.* 27(1):32-38. Jan. 1980. SFA 25(3)

[407 53rd St., Rome, NY 13440] Static bioassay tests of propoxur were conducted using brook trout and landlocked salmon fingerlings to produce estimates of acute toxicity. For brook trout, the 24-hour $EC_{50}$ was estimated to be 3.0 milligrams per liter, and the 24-hour $LC_{50}$ was estimated to be 6.0 milligrams per liter. The 24-hour $LC_{50}$ for landlocked salmon was estimated to be 11.2 milligrams per liter. It is considered highly unlikely that normal application rates would produce such concentrations, and direct mortality of these species as a result of such applications would probably not occur.

80-002345 Davenport, J.; S. Lønning and L. J. Sæthre. THE EFFECTS OF EKOFISK OIL EXTRACT UPON OXYGEN UPTAKE IN EGGS AND LARVAE OF THE COD *GADUS MORHUA* L. *Astarte* 12(1):31-34. 1979. SFA 25(3)

[N.E.R.C. Unit Mar. Invert. Biol., Mar. Sci. Lab., Menai Bridge, Gwynedd, Wales] Ekofisk oil extract (8ppm total hydrocarbons dissolved and dispersed oil) had no significant effect upon oxygen uptake in late stage cod embryos and larvae with functional yolk sacs. However, early embryos and starved larvae showed a reduction in oxygen consumption when placed in the extract; it was also noted that starved larvae became narcotised. Despite these results, doubt is expressed concerning the usefulness of oxygen consumption measurements in elucidating subtle sublethal effects of pollutants.

80-002346 Daye, P. G. ATTEMPTS TO ACCLIMATE EMBRYOS AND ALEVINS OF ATLANTIC SALMON, *SALMO SALAR*, AND RAINBOW TROUT, *S. GAIRDNERI*, TO LOW pH. *Can. J. Fish. Aquatic Sci.* 37(6):1035-1038. June 1980. In English with French summ. SFA 25(3)

[Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

80-002347 Edgren, M. and M. Notter. CADMIUM UPTAKE BY FINGERLINGS OF PERCH (*PERCA FLUVIATILIS*) STUDIED BY Cd-115M AT TWO DIFFERENT TEMPERATURES. *Bull. Environ. Contam. Toxicol.* 24(5):647-651. May 1980. SFA 25(3)

[Natl. Swed. Environ. Prot. Bd., S-170 11 Drottningholm, Sweden]

80-002348 Elmore, M. B.; T. L. Beitinger and D. W. Huey. TOXICITY OF PULSED MONOCHLORAMINES TO GOLDFISH (*CARASSIUS AURATUS*). *Bull. Environ. Contam. Toxicol.* 24(5):692-695. May 1980. SFA 25(3)

[Dep. Biol. Sci., North Tex. State Univ., Denton 76203]

TOXICOLOGY; BIOASSAYS (CONTINUED)

80-002349 Finlayson, B. J. and K. M. Verrue. ESTIMATED SAFE ZINC AND COPPER LEVELS FOR CHINOOK SALMON, *ONCORHYNCHUS TSHAWYTSCHA*, IN THE UPPER SACRAMENTO RIVER, CALIFORNIA. *Calif. Fish Game* 66(2):68-82. Apr. 1980. SFA 25(3)

[Calif. Dep. Fish Game, Water Pollut. Control Lab., 2005 Nimbus Rd., Rancho Cordova 95670] Long-term (83-d) and short-term (96-h) toxicity tests with combined copper and zinc solutions were conducted on chinook salmon, *Oncorhynchus tshawytscha*, eggs, alevins, and swim-up fry to determine tolerance levels to copper and zinc in the acid-mine waste from Spring Creek, a tributary to the Sacramento River. The ratio of copper-to-zinc in the waste can vary between 1:2 and 1:12. Eggs were just as tolerant or more tolerant than alevins and fry to combined concentrations of copper and zinc. The 83-d LC50 values (median lethal) for the period of eggs-to-fry to 1:3, 1:6, and 1:11 copper-to-zinc ratio stock solutions were 44 µg/l Cu and 160 µg/l Zn, 27 µg/l Cu and 206 µg/l Zn, and 17 µg/l Cu and 253 µg/l Zn, respectively, demonstrating that the toxicities of copper and zinc were "additive". The 96-h LC50 values for fry not previously exposed to the stock solutions were 37 µg/l Cu and 132 µg/l Zn, 29µg/l Cu and 213 µg/l Zn, and 20 µg/l Cu and 279 µg/l Zn, for the same copper-to-zinc ratio stock solutions, respectively, demonstrating that an acclimation to these metals had occurred in the 83-d tests during embryonic and alevin development at the higher (1:3) copper-to-zinc ratio but not at the lower (1:6 and 1:11) copper-to-zinc ratios. Based on reduced growth of exposed fry for the period of eggs-to-fry, estimated "safe" levels of copper and zinc for chinook salmon would be below 11 and 83 µg/l, respectively.

80-002350 Garofano, J. S. THE EFFECTS OF CADMIUM ON THE PERIPHERAL BLOOD AND HEAD KIDNEY OF THE BROWN BULLHEAD *ICTALURUS NEBULOSUS* (LESUEUR). *Ph.D. dissertation, N.Y. Univ.* 134p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(11):5109. May 1980. SFA 25(3)

The results of the present study suggest that acute exposure of fish to cadmium increases the cadmium accumulation in the fish. The rate of accumulation was different for the blood as compared to that in the head kidney which accumulates cadmium at significantly high levels for up to two months following the intial exposure. It seems that the physiologic mechanism governing the proliferative regulatory mechanism in the fish is similar to those of mammalian vertebrates. Although the feedback mechanism may be modified in lower vertebrates, nonetheless the present investigation confirms that some undifferentiated stem cell must have been triggered to become all of the cells that would eventually be delivered to the peripheral circulation.--From abstr.

80-002351 Graves, W. C.; D. T. Burton, L. B. Richardson and S. L. Margrey. SURVIVAL OF SHEEPSHEAD MINNOW (*CYPRINODON VARIEGATUS*) EMBRYOS, FRY, JUVENILES AND ADULTS EXPOSED TO TREATED BLEACHED KRAFT MILL EFFLUENT AT VARIOUS DISSOLVED OXYGEN LEVELS. *ABS (Assoc. Southeast. Biol.) Bull.* 27(2):37. Apr. 1980. SFA 25(3)

[Benedict Estuarine Lab., Benedict, MD] The interaction of dissolved oxygen (DO) concentration and treated bleached kraft mill effluent (BKME) on the survival of embryo, fry, juvenile and adult developmental stages of the sheepshead minnow (*Cyprinodon variegatus*) was investigated by using a 3 X 3 complete matrix design with two replicates per cell. Each life stage was exposed under continuous-flow conditions to effluent concentrations of 0, 50% and 100% (1/vv) and nominal DO concentrations of 1.0, 3.0 and 5.0 mg/l. Mortality observations at the end of 96 h were used for statistical analyses. The percent of embryo hatching success was solely related to effluent concentration. Survival of the fry was related to effluent concentration. Juvenile fish showed increased sensitivity to BKME at a nominal DO concentration of 1.0 mg/l. Adult fish were not affected by BKME at any of the DO concentrations tested. This study shows that a systematic investigation must be made on each life stage of a test organism in order to fully evaluate any potential interactions of treated BKME and low DO interactions of treated BKME and low DO concentrations.

TOXICOLOGY; BIOASSAYS (CONTINUED)

80-002352 Guiney, P. D.; J. J. Lech and R. E. Peterson. DISTRIBUTION AND ELIMINATION OF A POLYCHLORINATED BIPHENYL DURING EARLY LIFE STAGES OF RAINBOW TROUT (*SALMO GAIRDNERI*). *Toxicol. Appl. Pharmacol.* 53(3):521-529. May 1980. SFA 25(3)
[Sch. Pharm., Univ. Wis., Madison 53706]

80-002353 Hawkins, W. E.; L. G. Tate and T. G. Sarphie. ACUTE EFFECTS OF CADMIUM ON THE SPOT *LEIOSTOMUS XANTHURUS* (TELEOSTEI): TISSUE DISTRIBUTION AND RENAL ULTRASTRUCTURE. *J. Toxicol. Environ. Health* 6(2):283-295. Mar. 1980. SFA 25(3)
[Dep. Anat. Biol., Univ. South Ala., Mobile]

80-002354 Hedtke, S. F. and F. A. Puglisi. EFFECTS OF WASTE OIL ON THE SURVIVAL AND REPRODUCTION OF THE AMERICAN FLAGFISH, *JORDANELLA FLORIDAE*.
[U.S. EPA, Newtown Fish Toxicol. Stn., 3411 Church St., Cincinnati, OH 45244]

80-002355 Helder, T. EFFECTS OF 2,3,7,8-TETRACHLORODIBENZO-*p*-DIOXIN (TCDD) ON EARLY LIFE STAGES OF THE PIKE (*ESOX LUCIUS* L.). *Sci. Total Environ.* 14(3):255-264. Apr. 1980. SFA 25(3)
[Dep. Spec. Anim. Pathol., Univ. Utrecht, Biltstr. 172, Utrecht, The Netherlands] Freshly fertilized pike eggs were exposed to 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) at concentrations of 0.1, 1.0 and 10 ppt (ng/liter) for 96 hours. At all concentrations examined egg development was retarded by 23%, and the growth of fry was also significantly retarded for a long period after exposure. A dose-related mortality was observed. Highest mortality rates occurred during resorption of the yolk and reached almost 100 percent at a concentration of 10 ppt. Death was preceded by development of severe generalized edemas. Histopathologically edemas and hemorrhages were observed, together with alterations of bloodvessel walls. In the liver, two stages of pathological changes were distinguished. The first was characterized by a dilation of sinusoids and a slight swelling of hepatocyte nuclei; in the second stage the nuclei were enlarged up to twice the normal diameter. Hepatocytes were degenerated and varied in size and shape and liver architecture was almost completely lost.

80-002356 Herzberg, A.; A. Gelman and A. S. Perry. THE LOCATION OF LINDANE (GAMMA-HEXACHLOROCYCLOHEXANE) IN FISH AFTER DELIBERATE POISONING. *Bamidgeh* 32(1):16-19. Mar. 1980. SFA 25(3)
[Minist. Agric., Dep. Fish., Fish. Technol. Unit, P.O.B. 699, Haifa 31000, Israel]

80-002357 Hodson, P. V.; D. J. Spry and B. R. Blunt. EFFECTS ON RAINBOW TROUT (*SALMO GAIRDNERI*) OF A CHRONIC EXPOSURE TO WATERBORNE SELENIUM. *Can. J. Fish. Aquatic Sci.* 37(2):233-240. Feb. 1980. In English with French summ. SFA 25(3)
[Can. Cent. Inland Waters, Burlington, ON L7R 4A6, Canada]

80-002358 Hodson, P. V.; J. W. Hilton; B. R. Blunt and S. J. Slinger. EFFECTS OF DIETARY ASCORBIC ACID ON CHRONIC LEAD TOXICITY TO YOUNG RAINBOW TROUT (*SALMO GAIRDNERI*). *Can. J. Fish. Aquatic Sci.* 37(2):170-176. Feb. 1980. In English with French summ. SFA 25(3)
[Dep. Fish Oceans, Great Lakes Biolimnol. Lab., Can. Cent. Inland Waters, Burlington, ON L7R 4A6, Canada]

TOXICOLOGY; BIOASSAYS (CONTINUED)

80-002359 Hollister, T. A.; G. S. Ward and P. R. Parrish. ACUTE TOXICITY OF A #6 FUEL OIL TO MARINE ORGANISMS. *Bull. Environ. Contam. Toxicol.* 24(5):656-661. May 1980. SFA 25(3)
[EG&G, Bionomics, Mar. Res. Lab., Rt. 6, Box 1002, Pensacola, FL 32507]

80-002360 James, M. O. and J. R. Bend. POLYCYCLIC AROMATIC HYDROCARBON INDUCTION OF CYTOCHROME *P*-450-DEPENDENT MIXED-FUNCTION OXIDASES IN MARINE FISH. *Toxicol. Appl. Pharmacol.* 54(1):117-133. 15 June 1980. SFA 25(3)
[N.I.E.H.S. Lab., c/o C.V. Whitney Lab. Exp. Mar. Biol. Med., RFD 1, Box 121, St. Augustine, FL 32084]

80-002361 Kaiser, K. L. E. CORRELATION AND PREDICTION OF METAL TOXICITY TO AQUATIC BIOTA. *Can. J. Fish. Aquatic Sci.* 37(2):211-218. Feb. 1980. In English with French summ. SFA 25(3)
[Can. Cent. Inland Waters, Burlington, ON L7R 4A6, Canada]

80-002362 Kobayashi, K. and T. Kishino. EFFECT OF pH ON THE TOXICITY AND ACCUMULATION OF PENTACHLOROPHENOL IN GOLDFISH. *Bull. Jpn. Soc. Sci. Fish.* 46(2):167-170. Feb. 1980. SFA 25(3)
[Lab. Fish. Environ. Sci., Fac. Agric., Kyushu Univ., Fukuoka 812, Japan]

80-002363 Koschier, F. J. and J. B. Pritchard. RENAL HANDLING OF 2,4-D BY THE DOGFISH SHARK (*SQUALUS ACANTHIAS*). *Xenobiotica* 10(1):1-6. Jan. 1980. SFA 25(3)
[Food Drug Res. Lab., P.O. Box 107, Waverly, NY 14892]

80-002364 Kruzynski, G. M. SOME EFFECTS OF DEHYDROABIETIC ACID (DHA) ON HYDROMINERAL BALANCE AND OTHER PHYSIOLOGICAL PARAMETERS IN JUVENILE SOCKEYE SALMON *ONCORHYNCHUS NERKA*. *Ph.D. dissertation, Univ. British Columbia* 1979. From Diss. Abstr. Int. B Sci. Eng. 40(11):5170. May 1980. SFA 25(3)

80-002365 Leatherland, J. F. and R. A. Sonstegard. EFFECT OF DIETARY MIREX AND PCB'S IN COMBINATION WITH FOOD DEPRIVATION AND TESTOSTERONE ADMINISTRATION ON THYROID ACTIVITY AND BIOACCUMULATION OF ORGANOCHLORINES IN RAINBOW TROUT *SALMO GAIRDNERI* RICHARDSON. *J. Fish Dis.* 3(2):115-124. Mar. 1980. SFA 25(3)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

80-002366 Meade, T. L. and S. J. Perrone. EFFECT OF CHLORIDE ION CONCENTRATION AND pH ON THE TRANSPORT OF NITRITE ACROSS THE GILL EPITHELIA OF COHO SALMON. *Prog. Fish-Cult.* 42(2):71-72. Apr. 1980. SFA 25(3)
[Dep. Anim. Sci., Coll. Resour. Dev., Univ. R.I., Kingston 02881]

80-002367 Melancon, M. J. and J. J. Lech. UPTAKE, METABOLISM, AND ELIMINATION OF $^{14}$C-LABELED 1,2,4-TRICHLOROBENZENE IN RAINBOW TROUT AND CARP. *J. Toxicol. Environ. Health* 6(3):645-658. May 1980. SFA 25(3)
[Med. Coll. Wis., P.O. Box 26509, Milwaukee 53226] Fingerling rainbow trout (*Salmo gairdneri*) were exposed to $^{14}$C-labeled 1,2,4-trichlorobenzene (TCB) for 8 h in a static exposure (0.018 mg/l) or for 35 d in a continuous-flow exposure (0.020 mg/l) followed by a subsequent elimination period. For the 2 d after the 8-h exposure, the half-time ($t_{1/2}$) of elimination of $^{14}$C from muscle and liver was 0.4 d, while after the 35-d exposure an early rapid elimination of $^{14}$C from these tissues ($t_{1/2}$ = 0.4 d) was followed by a slower elimination ($t_{1/2}$ = 50 d) during d 4-36. The maximum bioconcentration factors for $^{14}$C in

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80-002367 CONTINUED muscle and liver were 51 and 102 after the 8-h exposure and 89 and 389 during the 35-d exposure. The values for bile were much greater, reaching 240 after the 8-h exposure and 89 and 389 during the 35-d exposure. The values for bile were much greater, reaching 240 after the 8-h exposure and 1400 during the 35-d exposure. When larger trout and carp (*Cyprinus carpio*) were exposed to [$^{14}$C]TCB(0.2-0.4 mg/l) the bioconcentration factor for bile $^{14}$C to water $^{14}$C was less than 100. Pretreatment of trout with β-naphthoflavone, an inducer of hepatic mixed-function oxidase, increased this bioconcentration factor for bile to several hundred. Solvent partitioning and thin-layer chromatography (TLC) indicated that about 60% of the $^{14}$C in bile of control trout or carp was present as highly polar biotransformation products, while for induced trout the value was more than 90%. TLC in two solvent systems suggested that at least two such products were present in bile from control fish and at least three in bile from induced fish. About half of the $^{14}$C in bile from induced trout was more polar than the $^{14}$C in bile from normal trout.

80-002368 Middaugh, D. P.; L. E. Burnett and J. A. Couch. TOXICOLOGICAL AND PHYSIOLOGICAL RESPONSES OF THE FISH, *LEIOSTOMUS XANTHURUS*, EXPOSED TO CHLORINE PRODUCED OXIDANTS. *Estuaries* 3(2):132-141. June 1980. SFA 25(3)

[Gulf Breeze Environ. Res. Lab., Bears Bluff Field Stn., Box 368, John's Island, SC 29455] The sublethal and lethal effects of chlorine produced oxidants (CPO) on juveniles of the estuarine teleost, *Leiostomus xanthurus*, were investigated in flowing water tests conducted at 30 ± 1°C and 26 to 31°/oo salinity. Short-term LT50 tests were conducted at two nominal concentrations of NaOCl, 1.0 and 1.4 mg/l (respective measured CPO concentrations 0.09 and 0.12 mg/l) which were sublethal in 2,880 minute exposures; and three nominal concentrations, 1.6, 1.8 and 3.2 mg/l NaOCl (respective measured CPO concentrations 0.13, 0.20 and 0.37 mg/l) which were acutely toxic. Opercular ventilation rates in exposed spot were much higher than in control fish, but returned to rates only slightly above those of controls during the latter portion of the 2,880 minute exposure to the two sublethal CPO concentrations. Opercular rates at the three acutely toxic CPO concentrations remained much higher than control rates until the exposed fish died. Blood pH after 2,880 minutes of exposure to the sublethal concentrations of CPO, or at the respective estimated LT50 for lethal concentrations, showed significant decreases (mean as low as 6.84) compared to controls (mean 7.35). No significant changes in the % methemoglobin were observed. Oxygen uptake by spot was depressed at all of the measured concentrations of CPO tested. Histopathological examination showed that gill respiratory epithelial tissues sloughed away from the underlying pillar cells. Complete denudation of circulatory tissues and hemangiectic secondary lamellae were observed in gill tissues from fish exposed to the highest CPO concentration of 0.37 mg/l.

80-002369 Panigrahi, A. K. and B. N. Misra. TOXICOLOGICAL EFFECTS OF A SUB-LETHAL CONCENTRATION OF INORGANIC MERCURY ON THE FRESH WATER FISH, *TILAPIA MOSSAMBICA*, PETERS. *Arch. Toxicol.* 44(4):269-278. Apr. 1980. SFA 25(3)

[Lab. Environ. Toxicol., Dep. Bot., Berhampur Univ., 760 007, Berhampur, Orissa, India]

80-002370 Peterson, R. H.; P. G. Daye and J. L. Metcalfe. INHIBITION OF ATLANTIC SALMON (*SALMO SALAR*) HATCHING AT LOW pH. *Can. J. Fish. Aquatic Sci.* 37(5):770-774. May. 1980. In English with French summ. SFA 25(3)

[Fish. Mar. Serv., Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

TOXICOLOGY; BIOASSAYS (CONTINUED)

80-002371 Pickering, Q. H. CHRONIC TOXICITY OF HEXAVALENT CHROMIUM TO THE FATHEAD MINNOW (*PIMEPHALES PROMELAS*). *Arch. Environ. Contam. Toxicol.* 9(4):405-413. 1980. SFA 25(3)

[U.S. EPA, Newtown Fish Toxicol. Stn., Cincinnati, OH 45244] The chronic effects of hexavalent chromium on the fathead minnow (*Pimephales promelas*) were investigated. Survival was affected only at the high test concentration of 3.95 mg Cr/L. All chromium concentrations, including 0.018 mg/L, the lowest tested, retarded the early growth of first-generation fish, but this effect was only temporary. Growth of second-generation fish was not affected at concentrations of 1.0 mg/L or lower. Reproduction and hatchability of eggs were not affected at any chromium concentration tested. The maximum acceptable toxicant concentration (MATC) for fathead minnows in hard water (209 mg/L as $CaCO_3$ at pH 7.7) was based on survival and lies between 1.0 and 3.95 mg Cr/L, respectively. The application factor (MATC/96-hr LC50) is between 0.03 and 0.11.

80-002372 Roales, R. R. and A. Perlmutter. METHYLMERCURY/COPPER EFFECTS ON HEMOSIDERIN: POSSIBLE MECHANISM OF IMMUNE SUPPRESSION IN FISH. *Bull. Environ. Contam. Toxicol.* 24(5):704-710. May 1980. SFA 25(3)

[Div. Biol. Phys. Sci., Indiana Univ., 2300 S. Washington St., Kokomo 46901]

80-002373 Sahib, I. K. A. and K. V. R. Rao. CORRELATION BETWEEN SUBACUTE TOXICITY OF MALATHION AND ACETYLCHOLINESTERASE INHIBITION IN THE TISSUES OF THE TELEOST *TILAPIA MOSSAMBICA*. *Bull. Environ. Contam. Toxicol.* 24(5):711-718. May 1980. SFA 25(3)

[Dep. Zool., S. V. Univ., Tirupati - 517 502, A.P. India]

80-002374 Sargent, J. R.; M. V. Bell; K. F. Kelly; A. Johnstone; A. Hawkins and C. D. Hall. SODIUM ORTHOVANADATE AND CARDIAC ACTIVITY IN TELEOST FISH. *Comp. Biochem. Physiol. C Comp. Pharmacol.* 66(1):111-114. 1980. SFA 25(3)

[N.E.R.C. Inst. Mar. Biochem., Aberdeen, Scotland] The electrocardiogram was monitored in decerebrate cod and trout after intravenous injection of sodium orthovanadate. Slowing of the heart rate occurred 1 min after injecting 84 µg of $Na_3VO_4$ (equivalent to 23µg elemental V). Heart beat was apparently suppressed for up to 30 min after injecting 168 µg of $Na_3VO_4$ and then returned to normal. Significant changes in heart rate and gill ventilation rate did not occur in fish exposed to $1/10^4$ M orthovanadate in the external medium for up to 6 days. Results are discussed in terms of possible toxicity of environmental vanadium to aquatic species.

80-002375 Sastry, K. V. and K. Sharma. EFFECTS OF MERCURIC CHLORIDE ON THE ACTIVITIES OF BRAIN ENZYMES IN A FRESH WATER TELEOST, *OPHIOCEPHALUS (CHANNA) PUNCTATUS*. *Arch. Environ. Contam. Toxicol.* 9(4):425-430. 1980. SFA 25(3)

[Sch. Environ. Contam. Toxicol., Dep. Zool., D.A.V. (P.G.) Coll., Muzaffarnagar-251001, India] The effects of an acute lethal (1.8 mg/L) and a sublethal concentration (0.3 mg/L) of mercuric chloride on the activities of alkaline phosphatase, acid phosphatase, glucose-6-phosphatase, $Na^+$, $K^+$ adenosine triphosphatase, succinic dehydrogenase, lactic dehydrogenase, pyruvic dehydrogenase and chloinesterase in the brain of a fresh water fish, *Ophiocephalus (Channa) punctatus* were determined. Exposures were for 4, 15 or 30 days. Acute exposure to mercuric chloride inhibited alkaline phosphatase activity while chronic treatment increased the activity. Acid phosphatase and $Na^+$, $K^+$ adenosine triphosphatase activities were elevated after four days, but chronic exposure inhibited

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80-002375 CONTINUED their activites. The activities of glucose-6-phosphatase, succinic dehydrogenase, lactic dehydrogenase, pyruvic dehydrogenase, and cholinesterase were inhibited by both acute and chronic treatments. Maximum inhibitions occurred after four days with alkaline phosphatase and cholinesterase, 15 days with acid phosphatase and 30 days with glucose-6-phosphatase, $Na^+$, $K^+$ adenosine triphosphatase, and the three dehydrogenases.

80-002376 Schnell, J. V.; E. H. Gruger, Jr. and D. C. Malins. MONO-OXYGENASE ACTIVITIES OF COHO SALMON (*ONCORHYNCHUS KISUTCH*) LIVER MICROSOMES USING THREE POLYCYCLIC AROMATIC HYDROCARBON SUBSTRATES. *Xenobiotica* 10(3):229-234. Mar. 1980. SFA 25(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112] Benzo[*a*]pyrene, 2,6-dimethylnaphthalene, and naphthalene were used as substrates for a coho salmon (*Oncorhynchus kisutch*) liver microsomal preparation. The apparent Michaelis constants ($K_m$) were as follows: benzo[*a*]pyrene, 2.1 µM; 2,6-dimethylnaphthalene, 15.3 µM; and naphthalene, 300 µM. The results indicate that the microsomal preparation had a high affinity for 2,6-dimethylnaphthalene. Thus, 2,6-dimethylnaphthalene, an important consitiuent of petroleum products, is a useful substrate for research on the disposition *in vivo* and *in vitro* of xenobiotics introduced into marine environments by petroleum pollution.

80-002377 Sharp, J. R. THE EFFECTS OF MERCURIC CHLORIDE AND METHYLMERCURIC CHLORIDE ON THE DEVELOPMENTAL BIOLOGY OF THE ESTUARINE TELOEST *FUNDULUS HETEROCLITUS* (WALBAUM). *Ph.D. dissertation, Tex. A&M Univ.* 242p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(12, part 1):5512. June 1980. SFA 25(3)

80-002378 Singh, H. and T. P. Singh. EFFECT OF TWO PESTICIDES ON OVARIAN $^{32}P$ UPTAKE AND GONADOTROPHIN CONCENTRATION DURING DIFFERENT PHASES OF ANNUAL REPRODUCTIVE CYCLE IN THE FRESHWATER CATFISH, *HETEROPNEUSTES FOSSILIS* (BLOCH). *Environ. Res.* 22(1):190-200. June 1980. SFA 25(3)
[Dep. Zool., Fish Endocrinol. Lab., Banaras Hindu Univ., Varanasi-221005, India]

80-002379 Singh, H. and T. P. Singh. THYROID ACTIVITY AND TSH POTENCY OF THE PITUITARY GLAND AND BLOOD SERUM IN RESPONSE TO CYTHION AND HEXADRIN TREATMENT IN THE FRESHWATER CATFISH, *HETEROPNEUSTES FOSSILIS* (BLOCH). *Environ. Res.* 22(1):184-189. June 1980. SFA 25(3)
[Dep. Zool., Fish Endocrinol. Lab., Banaras Hindu Univ., Varanasi-221005, India]

80-002380 Takaku, T.; M. Takahashi and A. Otsuki. [DISPERSION OF AN ORGANOPHOSPHORUS INSECTICIDE, FENITROTHION, IN PADDY FIELDS AND ITS EFFECTS ON THE MICROORGANISMS. *Jpn. J. Limnol.* 40(3):137-144. July 1979. In Japanese with English summ. SFA 25(3)
[Grad. Sch. Environ. Sci., Univ. Tsukuba, Sakura-mura, Ibaraki, 305 Japan]

80-002381 Verma, S. R.; S. Rani and R. C. Dalela. EFFECTS OF PHENOL AND DINITROPHENOL ON ACID AND ALKALINE PHOSPHATASES IN TISSUES OF A FISH (*NOTOPTERUS NOTOPTERUS*). *Arch. Environ. Contam. Toxicol.* 9(4):451-459. 1980. SFA 25(3)
[Pollut. Relevant Res. Lab., P.B. 264, Post-grad. Dep. Zool., D.A.V. Coll., Muzaffarngar-251001, India] Specimens of a fresh water fish, *Notopterus notopterus* were exposed to either phenol (12.56 mg/L), dinitrophenol (1.34 mg/L), or a mixture of the two (6.28 mg phenol + 0.67 mg dinitrophenol/L) for 72-hr. Surviving fish were sacrificed at 24-, 48-, and

TOXICOLOGY; BIOASSAYS (CONTINUED)

80-002381 CONTINUED 72-hr after exposure, and tissue samples were taken for determining the acid phosphatase and alkaline phosphatase activities. Phenol, dinitrophenol, and mixtures of both, inhibited the activity of both enzymes in the kidney, heart, brain, gills, muscles, stomach, intestine, and pyloric caeca. Dinitrophenol exerted more inhibition than phenol. In general, mixtures of phenol and dinitrophenol are somewhat more effective than either compound alone in the inhibition of enzyme activities.

80-002382 Watson, T. A. and F. W. H. Beamish. EFFECTS OF ZINC ON BRANCHIAL ATPase ACTIVITY *IN VIVO* IN RAINBOW TROUT, *SALMO GAIRDNERI*. *Comp. Biochem. Physiol. C Comp. Pharmacol.* 66(1):77-82. 1980. SFA 25(3)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

FISH TOXICANTS

80-002383 Niblett, P. D. and B. A. McKeown. EFFECT OF THE LAMPREY LARVICIDE TFM (3-TRIFLUOROMETHYL-4-NITROPHENOL) ON EMBRYONIC DEVELOPMENT OF THE RAINBOW TROUT (*SALMO GAIRDNERI*, RICHARDSON). *Water Res.* 14(5):515-519. 1980. SFA 25(3)
[Proctor & Redfern Group, 75 Eglinton Ave. East, Toronto, ON M4P 1H3, Canada] Toxicity of the lamprey larvicide TFM to rainbow trout embryos was found to be greatest immediately following fertilization and least after neurulation. Embryonic mortality in the early stages was delayed and not recognized by the presence of a white protein precipitate.

80-002384 Serns, S. L. EFFECTS OF PRO-NOXFISH® ON THE BENTHOS AND ZOOPLANKTON OF BUG LAKE, FOREST COUNTY, WISCONSIN. *Water Resour. Bull.* 5(2). Oct. 1979. SFA 25(3)
[Box 440, Woodruff, WI 54568] A concentration of 2.5 mg/l Pro-Noxfish® (0.063 mg/l rotenone and 0.063 mg/l sulfoxide) was applied to Bug Lake, Wisconsin, on November 17, 1975. There was an immediate toxicity to zooplankton and *Chironomus*. All taxa of benthic organisms and zooplankton that were present before toxicant application survived the treatment except for *Pleuroxus denticulatus* which was collected in only one sample before treatment. Comparable densities of benthic and zooplankton taxa were found on individual sampling dates before and after treatment; however, mean densities of trichopterans and dipterans were lower after treatment. The high variance in the samples along with the change in fish population after treatment are believed responsible for this indicated change in benthos density rather than the effects of the rotenone.

RESEARCH AND MANAGEMENT-GENERAL

80-002385 Anderson, L. G. NECESSARY COMPONENTS OF ECONOMIC SURPLUS IN FISHERIES ECONOMICS. *Can. J. Fish. Aquatic Sci.* 37(5):858-870. May 1980. In English with French summ. SFA 25(3)
[Dep. Econ., Univ. Del., Newark 19711]

80-002386 Hulbert, P. J. and R. Engstrom-Heg. HOOKING MORTALITY OF WORM-CAUGHT HATCHERY BROWN TROUT. *N.Y. Fish Game J.* 27(1):1-10. Jan. 1980. SFA 25(3)
[N.Y. State Dep. Environ. Conserv., Stamford 12167] The mortality of sub-legal (in New York) brown trout taken by angling with worm-baited hooks of five different sizes was investigated, using age 1+ hatchery-reared fish

RESEARCH AND MANAGEMENT-GENERAL (CONTINUED)

80-002386 CONTINUED released in late spring in a small pond. Comparable numbers were handled with wet or dry hands, and the hooks were removed manually, except that for some that had been deeply hooked the leaders were clipped. The fish were then held in aquaria together with control fish for 14 days and their mortality was recorded. The data were analyzed according to whether the fish had been lightly hooked or deeply hooked. Two-thirds of the trout taken were lightly hooked, and their mortality (0.9 per cent) was not significantly different from that of the controls. For deeply hooked trout, the mortality was 59 per cent when the hooks were removed but only 18 per cent when the leaders were clipped. The data suggest that, for all the trout taken, the short-term mortality would have been about 22 per cent if all hooks had been removed by hand but only about 7 per cent if the leaders had been clipped on all deeply hooked fish. Handling with wet or dry hands had little effect on mortality. The leader-clipped specimens that survived the initial test period were held over the summer and, while additional mortality occurred, all fish surviving the summer were able to feed and grow.

80-002387 Mason, W. T., Jr.; C. T. Cushwa; L. J. Slaski and D. N. Gladwin. A PROCEDURE FOR DESCRIBING FISH AND WILDLIFE CODING INSTRUCTIONS FOR PENNSYLVANIA. (2 vol.). *U.S. Fish Wildl. Serv.* FWS/OBS-79/19. ix + 21p. Dec. 1979. SFA 25(3)
[U.S. FWS, Eastern Energy Land Use Team, Route 3, Box 44, Kearneysville, WV 25430]

ADMINISTRATION AND PLANNING

80-002388 Horak, G. C. and J. E. Olson. THE NEED FOR STANDARDS AND CRITERIA TO DETERMINE EFFECTIVENESS AND RECOMMENDATIONS FOR REPORTING REQUIREMENTS. *Fisheries (Bull. Am. Fish. Soc.)* 5(3):2-5. May-June 1980. SFA 25(3)
[Environ. Control, Inc., 1520 E. Mulberry, Fort Collins, CO 80524] The water resource planning process as outlined by Federal legislation is incomplete. There is no provision for systematic monitoring to insure that measures for the protection of fish and wildlife are implemented, and that the measures successfully maintain and improve the resource. The need for standards and criteria to determine effectiveness is discussed in this paper. Annual reports by the project-sponsoring agency to detail the status and results of the measures are recommended.

80-002389 PROCEEDINGS OF THE WESTERN ASSOCIATION OF FISH AND WILDLIFE AGENCIES AND THE WESTERN DIVISION AMERICAN FISHERIES SOCIETY. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 59:vii + 258p. 1979. SFA 25(3)
A collection of papers dealing primarily with State-Federal relations, especially regarding Alaska.--RS.

REPORTS OF FISHERY STATIONS, STATES, ETC.

80-002390 Pacific Marine Fisheries Commission. 32ND ANNUAL REPORT OF THE PACIFIC MARINE FISHERIES COMMISSION. *Pac. Mar. Fish Comm. Annu. Rep.* 32. 49p. May 1980. SFA 25(3)
[528 S.W. Mill St., Portland, OR 97201]

## HABITAT ALTERATIONS

80-002391 Berry, C. R., Jr. THE VALUE OF HABITAT IMPROVEMENT DEMONSTRATION AREAS FOR INFORMING THE PUBLIC. *Fisheries (Bull. Am. Fish. Soc.)* 5(3):22-25. May-June 1980. SFA 25(3)
[Utah Coop. Fish. Res. Unit, Utah State Univ., Logan]

80-002392 Clugston, J. P., ed. PROCEEDINGS OF THE CLEMSON WORKSHOP ON ENVIRONMENTAL IMPACTS OF PUMPED STORAGE HYDROELECTRIC OPERATIONS. *U.S. Fish Wildl. Serv.* FWS/OBS-80/28. iv + 206p. Apr. 1980. SFA 25(3)
[U.S. FWS, Southeast Reservoir Invest., 206 Highway 123 By-Pass, Clemson, SC 29631]

80-002393 Gislason, J. C. EFFECTS OF FLOW FLUCTUATION DUE TO HYDROELECTRIC PEAKING ON BENTHIC INSECTS AND PERIPHYTON OF THE SKAGIT RIVER, WASHINGTON. *Ph.D. dissertation, Univ. Wash.* 175p. 1980. From Diss. Abstr. Int. B Sci. Eng. 40(12, part 1):5539. June 1980. SFA 25(3)

80-002394 Guillebeau, T. M.; H. L. Stirewalt; K. F. Nearhoof; F. L. Nearhoof; D. M. Adams and E. A. Lamar. A SECOND YEAR STUDY OF THE EFFECTS OF RECHANNELIZATION ON THE PLANKTONIC AND BENTHIC ORGANISMS IN THE SAVANNAH RIVER: PART I. *Ga. J. Sci.* 38(2):92. Apr. 1980. Abstract only. SFA 25(3)
[Augusta Coll., Augusta, GA] During an eight month period in 1979, six plankton samples and eleven bottom samples were collected from three representative areas within the Coastal Plain region of the Savannah River. The plankton samples were obtained with a 70 micron mesh quantitative sampling net and the benthic organisms were sampled with an Ekman dredge. Upon application of Student's t-test to the plankton data for 1979, differences of 90% or better were revealed in two of six comparisons. (Plankton analysis for 1978 revealed no significant differences in eight comparisons.) In 1979, application of the Mann-Whitney U-test to the analysis of the benthic organisms revealed no significant differences. Analysis of samples taken in 1978 revealed no significant differences in all comparisons.

80-002395 Hunt, R. L. REMOVAL OF WOODY STREAMBANK VEGETATION TO IMPROVE TROUT HABITAT. *Wis. Dep. Nat. Resour. Tech. Bull.* No. 115. 36p. 1979. SFA 25(3)
[Rt. 1, Box 589, Waupoca, WI 54981] Woody vegetation, primarily speckled alder (*Alnus rugosa*), was removed at ground level from 30-ft strips paralleling both banks of three small trout streams to improve trout habitat, trout populations and fishing. In all three streams, despite variations in discharge and trout abundance, posttreatment growth rates of most age groups of trout were slightly better in Treatment Zones then in Reference Zones. Prior to brushing, Treatment Zone growth rates were usually less than in Reference Zones. Angling use and exploitation rates increased in all study zones on the Little Plover River during the posttreatment phase of creel census (1976 only) compared to the two seasons of pretreatment creel census (1970 and 1972). Increased harvest of a previously lightly exploited stock was the only benefit for the sport fishery of removing woody streambank vegetation. No census was conducted on the other two study streams. Unanticipated extremes in streamflow variation confounded planned evaluations of changes in trout stocks, trout habitat and the sport fishery in response to removal of woody streambank vegetation. But in retrospect these conditions provided bonus insights that increased the previous limited knowledge of the impact that abnormally low stream flows have on trout stream ecosystems in Wisconsin. In all study zones of the Little Plover River, fall biomass of brook trout and mean summer flow (June through August) were significantly correlated; so too were maximum summer temperature and

HABITAT ALTERATIONS (CONTINUED)

80-002395 CONTINUED mean summer discharge. As an overview assessment of this pioneering experiment to improve trout habitat and sport fishing on small, heavily shaded trout streams in Wisconsin, I conclude that the technique has enough practical management application to merit additional testing of the kind used in my study (preferably during periods of more stable stream discharge) and experimentation with less severe modifications of shade canopy.--From abstr.

80-002396 Labaugh, J. W. WATER CHEMISTRY CHANGES DURING ARTIFICIAL AERATION OF SPRUCE KNOB LAKE, WEST VIRGINIA. *Hydrobiologia* 70(3):201-216. 2 May 1980. SFA 25(3)

[USGS, Mail Stop 413, Denver Fed. Cent., Denver, CO 80225] The water mass below 3.5 m in Spruce Knob Lake was artificially aerated with a modified full lift aerator during two consecutive summers (1974 and 1975) of an investigation that began in July of 1973 and ended in September, 1975. Artificial aeration increased water temperature below 3.5 m without causing destratification. Several chemical parameters were significantly affected by artificial aeration, especially from July to autumnal overturn in 1974 and 1975. Below 3.5 m, total inorganic carbon, total alkalinity, nitrite, soluble reactive phosphorus, and total phosphorus, were lower during aeration than in the summer of no aeration (1973). Although artificial aeration lowered soluble reactive and total phosphorus, there was no significant impact on the phosphorus budget of the impoundment. In 1975, continuous aeration from vernal overturn to autumnal overturn resulted in higher nitrate concentrations below 3.5 m than in the preceeding summers. Lower pH values encountered through the whole water column in 1975 followed a brief isothermal interruption of summer stratification in early June. There was no direct effect of artificial aeration on either temperature or water chemistry parameters in the epilimnion. Significantly lower chlorophyll concentrations observed in 1975 were related to destratification in June. Primary production was unaffected by aeration.

80-002397 Mauney, M. and G. L. Harp. THE EFFECTS OF CHANNELIZATION ON FISH POPULATIONS OF THE CACHE RIVER AND BAYOU DEVIEW. *Arkansas Acad. Sci. Proc.* 33:51-54. 1979. SFA 25(3)

[Dep. Fish. Sci., VPI&SU, Blacksburg, VA 24061] This study was designed to better understand the possible effects of channelization by comparing natural and previously channelized sections of the Cache River and Bayou DeView. Forty-five fish species were collected in natural reaches, but only 24 species were collected in channelized reaches. *Cyprinus carpio* and *Dorosoma cepedianum* constituted 40 and 20 percent of the total fish biomass in channelized reaches, respectively, but only 22 and 2 percent of the total biomass in natural reaches. The mean weight of total fishes and game fishes only per surface ha in natural sections were 276 and 46 kg, respectively, but these values in channelized sections were only 88 and 2 kg, respectively. Mean species diversity indices for natural and channelized sections of the Cache River were 3.1 and 1.8, respectively, and mean redundancy values for these sections were .30 and .55, respectively. Species diversity indices and redundancy values for Bayou DeView followed this trend.

80-002398 Mauney, M. and J. J. Ney. IMPACT OF IMPOUNDMENT ON DOWNSTREAM FISH AND BENTHIC MACROINVERTEBRATE COMMUNITIES IN A PIEDMONT STREAM. *Va. J. Sci.* 30(2):77. 1979. Abstract only. SFA 25(3)

[Dep. Fish. Wildl. Sci., VPI&SU, Blacksburg, VA 24061] Impact of a shallow, non-stratifying impoundment on stream biota was assessed through a one-year comparison of upstream and downstream stations. Stream physico-chemical properties were not altered. Estimated density, biomass, and production of the benthic community were greater in the tailwater than at the upstream or most downstream station and occurred primarily through increase in

HABITAT ALTERATIONS (CONTINUED)

80-002398 CONTINUED non-insect groups. Changes in macroinvertebrate composition appeared to be related to differences in food availability. The taxonomic composition of the fish community was similar among stations, but fish biomass was substantially greater in the tailwaters than at the other locations. The fish community in the tailwaters was not stable. Increased fish biomass and instability in the tailwaters may result from upstream movement and reservoir emigration. Transience may be enhanced by competition for food and/or space during some seasons. The downstream impact of the reservoir was very localized. Benthic and fish communities examined 1200 m below the impoundment were equivalent to upstream levels or were intermediate between those of the upstream and tailwater station.

80-002399 Mealing, H. C. III; H. L. Stirewalt; A. G. Woodward; J. R. Zets and R. J. Zets. THE EFFECTS OF RECHANNELIZATION ON THE DIET OF SOME GAME FISHES WITH A SUMMARY OF DATA OBTAINED FOR TWO YEARS: PART II. *Ga. J. Sci.* 38(2):92-93. Apr. 1980. Abstract only. SFA 25(3)

[Augusta Coll., Augusta, GA] Fifty-two fishes were collected primarily by the use of environmental-sampling gill nets from representative sites of the Upper, Middle, and Lower Coastal Plains of the Savannah River. Following laboratory classification and quantification of stomach contents, Student's t-test was applied which indicated significant differences at the 90% level or better in six of seven comparisons for 1979. Analysis for 1978 showed a significant difference at the 80% confidence level or better in four of twelve comparisons.

80-002400 Mulvihill, E. L.; C. A. Francisco; J. B. Glad; K. B. Kaster and R. E. Wilson. BIOLOGICAL IMPACTS OF MINOR SHORELINE STRUCTURES ON THE COASTAL ENVIRONMENT: STATE OF THE ART REVIEW. VOL. II. *U.S. Fish Wildl. Serv.* FWS/OBS-77/51. viii + 306p. Mar. 1980. SFA 25(3)

[Beak Consultants, Inc., 317 S.W. Alder, Portland, OR 97204]

80-002401 Mulvihill, E. L.; C. A. Francisco; J. B. Glad; K. B. Kaster and R. E. Wilson. BIOLOGICAL IMPACTS OF MINOR SHORELINE STRUCTURES ON THE COASTAL ENVIRONMENT: STATE OF THE ART REVIEW. VOL. I. *U.S. Fish Wildl. Serv.* FWS/OBS-77/51. viii + 156p. Mar. 1980. SFA 25(3)

[Beak Consultants, Inc., 317 S. W. Alder, Portland, OR 97204] Beak Consultants Incorporated conducted a state of the art review of the biological impacts of minor shoreline structures on the coastal environment. The types of structures included in this study were as follows: breakwaters, jetties, groins, bulkheads, revetments, ramps, piers and other support structures, buoys and floating platforms, harbors for small craft, bridges and causeways. A total of 555 information sources were obtained at which approximately 220 references were found by commercial bibliographic searches. Other sources were located by cross referencing from identified sources; visiting key libraries; interviewing and sending questionnaires to institutions, government agencies, and individuals who might have had useful information. Information was extracted from the literature and compiled by type of shoreline structure and by coastal region. The following categores of information were sought: structure functions; site characteristics; geographic prevalence; engineering, socioeconomic and biological placement constraints; construction materials; expected life span; environmental conditions; methodology of environmental impact studies; physical and biological impacts; and structural and nonstructural alternatives. Existing information was evaluated and a text was prepared (Volume I). An annotated bibliography, keyword index, and primary author reference number index were produced from the data base (Volume II). This state of the art review summarizes and evaluates the information found in the literature for each type of structure. Areas requiring additional study are delineated. Germane

HABITAT ALTERATIONS (CONTINUED)

80-002401 CONTINUED studies in progress are identified, and selected case histories depicting the impacts of shoreline structures are presented as part of the review. The impact of any structure on the coastal environment is site-specific and should be considered on a case-by-case basis. Few studies were found which quantitatively investigated the impacts of specific structures. Structures which appear to have the greatest potential for impacting the coastal environment are small boat harbors, bridges and causeways, bulkheads, breakwaters, and jetties. Those with moderate impact potential are revetments, groins, and ramps. Low-impact potential structures include buoys and floating platforms, and piers, pilings and other support structures. Based on this classification scheme and the number and types of information sources located, bridges, causeways, and small boat harbors have received very little study relative to their potential impacts.

80-002402 Slade, E. A.; J. B. Harper; K. S. Clark and G. E. Stanton. EFFECTS OF URBANIZATION ON ROARING BRANCH CREEK. *Ga. J. Sci.* 38(2):93. Apr. 1980. Abstract only. SFA 25(3)

[Columbus Coll., Columbus, GA] Roaring Branch Creek, located in northwest Columbus, Georgia, has been of concern to local residents for some time due to its flooding potential and value as a natural corridor. This concern created the foundation for the study conducted during the summer of 1979 to determine the baseline ecology of Roaring Branch Creek. In addition, comparisons were undertaken between the ecology of the Roaring Branch Ecosystem and the ecology of Lindsey Creek, a nearby stream of similar origin, but which has already been urbanized. The most obvious chemical pattern was one in which mean concentrations of chemicals were highest at the industrial park site especially iron and manganese. Microbiological data indicated total fecal coliform exceeded the state Environmental Protection Division's safety limit at all sites in both creeks on all dates. Lindsey Creek had significantly greater mean densities and biomass of invertebrates than Roaring Branch, due largely to the high density of Bivalvia, Trichoptera, principally from the family Hydropsychidae, clearly dominated the benthic invertebrate fauna of Roaring Branch Creek. The fish of Roaring Branch were warm water species: centrachids, ictalurids and cyprinids. Lindsey Creek has significantly larger mean densities and biomass than Roaring Branch Creek, even considering the fact that no fish were collected at a concrete channelized site.

HARVEST, CREEL CENSUS, ETC.

80-002403 Carls, E. G. COMPARATIVE CHARACTERISTICS OF SURF FISHERMEN AND BOAT FISHERMEN ON LONG ISLAND, NEW YORK. *N.Y. Fish Game J.* 27(1):51-62. Jan. 1980. SFA 25(3)

[Dep. Recreation Parks, Tex. A&M Univ., College Station] Participation in sport fishing and over-all satisfaction with the angling experience depends on several interacting environmental, economic and psycho-social factors. Surveys of surf fishermen and boat fishermen on Long Island (N.Y.) provided data on the characteristics of these fishermen and on several associated variables relating to their attitudes, interests and behavior. In many basic ways, the two groups are similar in their fishing habits and expectations, but there are enough important differences to warrant considering them as distinct groups with separate needs for enjoying their sport. The findings should be useful to those responsible for natural-resource administration, as well as have value for commercial sport fishing industries in the area.

HARVEST, CREEL CENSUS, ETC. (CONTINUED)

80-002404 Ernst, D. and T. C. Osborn. THE SUMMER SPORTFISHERY IN VOYAGEURS NATIONAL PARK AND SURROUNDING WATERS FOR 1977 AND 1978. *Minn. Dep. Nat. Resour. Fish Sect. Invest. Rep.* No. 370. 37p. Apr. 1980. SFA 25(3)
[Rt. 9, Box 217, International Falls, MN 56649] A creel census on the lakes which comprise or are associated with Voyageurs National Park was conducted during the summers' of 1977 and 1978 to provide baseline data on the sport fishery. Of the five lakes censused, two, Crane and Kabetogama, are located wholly within the U.S., and three, Namakan, Rainy and Sand Point are U.S.-Canadian border lakes. The census, a nonuniform sampling type, was quantitative except for the Canadian portion of Rainy Lake which is accessible from Canada. Total fishing effort averaged 7.4 manhours per acre. U.S. waters averaged 8.3 manhours per acre and Canadian waters averaged 1.7 manhours. Fishing pressure on individual lakes ranged from 20.8 manhours per acre on Kabetogama to 4.9 on Namakan Lake (Rainy excluded). More than half of all fishing trips were made on Kabetogama Lake. Fifty-four percent of all fishermen were non-residents. The fishery on each of the lakes was similar in that walleye and northern pike were the principal species in the catch but the yields from each lake varied widely. The highest average annual yield was from Crane Lake (8.9 lbs. per acre); the walleye yield was 5.4 lbs. per acre and the northern pike yield was was 1.3 lbs. per acre. The U.S. waters of Rainy Lake yielded an average of 0.3 lbs. per acre of walleye and 0.4 lbs. per acre of northern pike; the total harvest was less than 0.8 lbs. per acre. The age class structure of the walleye harvest was similar from all lakes. Age III and IV walleye comprised the bulk of the catch. The average age of walleye harvested was about 4.5 years.

80-002405 FAO of the UN. 1978 YEARBOOK OF FISHERY STATISTICS. CATCHES AND LANDINGS. *FAO Fish. Ser.* 10:x + 372p. 1979. SFA 25(3)
[Rome, Italy]

80-002406 Moring, J. R. NONREPORTING OF RECAPTURES OF TAGGED RAINBOW TROUT FROM AN OREGON STREAM. *Prog. Fish-Cult.* 42(2):113-115. Apr. 1980. SFA 25(3)
[Me. Coop. Fish. Res. Unit, Dep. Zool., Univ. Me., Orono 04469]

80-002407 Panek, F. M. and N. Lamson. CHARACTERISTICS OF SPORT AND COMMERCIAL FISHERMEN RESIDING ON EASTERN LONG ISLAND, NEW YORK. *N.Y. Fish Game J.* 27(1):79-85. Jan. 1980. SFA 25(3)
[N.Y. State Dep. Environ. Conserv., Bur. Fish., Watertown 13601] A multiple-choice questionnaire designed to obtain information on fishermen living on eastern Long Island and their angling preferences was mailed to a random sample of households in the towns of Riverhead, Southold, Southampton, Shelter Island and East Hampton. Of 1,823 questionnaires delivered, 46 per cent were completed and returned, and from the data it was estimated that there were 50,750 saltwater anglers residing in the five towns surveyed. Respondents averaged 22 trips per year of which 96.9 per cent were one day or less in duration, representing an estimated 1,116,508 fishing trips by local anglers in 1977 at an expense of some $12,281,600. A substantial proportion of the recreational fishermen (48.6 per cent) favored a saltwater fishing license, and 81.6 per cent favored regulations fixing minimum size and daily catch limits. Response by commercial fishermen was poor (5 per cent), but respondents strongly favored establishing exclusive fishing zones, licensing recreational shellfishermen and a marine commercial fishing license if the revenue from it were for reseeding shellfish beds.

REGULATIONS

80-002408 Favro, L. D.; P. K. Kuo and J. F. McDonald. EFFECTS OF

REGULATIONS (CONTINUED)

80-002408 CONTINUED UNCONVENTIONAL SIZE LIMITS ON THE GROWTH RATE OF TROUT. *Can. J. Fish. Aquatic Sci.* 37(5):873-876. May 1980. In English with French summ. SFA 25(3)
[Dep. Phys., Wayne State Univ., Detroit, MI 48202]

MARKING AND TAGGING

80-002409 Lomas, M. H. SHARKPATH PLOT: A COMPUTER-BASED SYSTEM FOR X-Y PLOTTING OF MOVEMENTS OF ACOUSTICALLY TAGGED SHARKS. *M.A. thesis, Calif. State Univ.* 125p. 1979. From Masters Abstr. 18(2):76. June 1980. SFA 25(3)
An X-Y plotting system was developed to monitor the movements of free-swimming sharks tagged with ultrasonic transmitters. Times-of-arrival of ultrasonic pulses between two omnidirectional hydrophones and a reference timefix oscillator are field recorded on magnetic tepe. Laboratory processing involves three computers (micro, mini, maxi) and a digital plotter to generate the second-by-second plots. Theoretical angular resolution ranges from ±0.3° at 90° to ±4.0° at 0° and 180°; distance resolution is ±0.1 m for 0-51 m or ±0.5 m for 0-255 m. In the most useful plotting sector (about 20-160°, within 60 m), real-data X-Y plots showed an adjustable system accuracy close to the above, i.e., within approximately ±1 m, and a jitter of ±0.2 to 0.5 m. Tests confirmed the system's usefulness for plotting shark movements in both confined and open environments. Limitations are discussed and improvements suggested.

80-002410 McAfee, M. A PORTABLE BLACK-LIGHT BOX FOR DETECTING FLUORESCENT PIGMENT ON FISH. *Colo. Div. Wildl. Fish. Inf. Leafl.* No. 33. 2p. Apr. 1980. SFA 25(3)
[Colo. Div. Wildl., 317 W. Prospect, Fort Collins, 80526]

80-002411 Selby, D. IS RADIO-TAGGING A VIABLE TECHNIQUE FOR COLORADO SQUAWFISH? *Summ. Proc. Annu. Symp. Desert Fish. Counc.* 10:47. 30 Jan. 1980. Abstract only. SFA 2593)
[BIO/WEST, Inc., Logan, UT]

STOCKING AND INTRODUCTIONS

80-002412 Beyerle, G. B. CONTRIBUTION TO THE ANGLERS' CREEL OF MARSH-REARED NORTHERN PIKE STOCKED AS FINGERLINGS IN LONG LAKE, BARRY COUNTY, MICHIGAN. *Mich. Dep. Nat. Resour. Fish. Res. Rep.* No. 1876. 22p. 27 Feb. 1980. SFA 25(3)
[Mich. Dep. Nat. Resour., East Lansing] From 1973 to 1975 marsh-reared northern pike were stocked into Long Lake, Barry County, at the average rate of 40 fingerlings per hectare, per year, at a cost of $0.20 each. Survival of these fish to the anglers' creel varied from 15.8 to 36.3% (mean, 23.7%). The harvest of each year class was essentially complete 4 years after stocking. Marsh-reared fish provided 65.1% of the total harvest from the 1973-75 year classes of northern pike. The cost to produce the harvested marsh-reared northern pike was $0.87 per fish, or $0.70 per kilogram. During the study the growth of panfish remained within the anticipated range for southern Michigan lakes. There was no fluctuation in harvest of panfish or largemouth bass that could be related to abundance of northern pike.

STOCKING AND INTRODUCTIONS (CONTINUED)

80-002412 CONTINUED It was suggested that the stocking rate of northern pike could be increased to 8,000 fingerlings (68.4 per hectare) with no detrimental effect on other fish species in Long Lake.

80-002413 Bilton, H. T. and D. W. Jenkinson. RETURN TO THE FISHERY AND ESCAPEMENT OF ADULT COHO SALMON FROM ACCELERATED JUVENILES RELEASED IN THE FALL OF 1974. *Can. Dep. Fish. Oceans Tech. Rep.* No. 943. iv + 11p. May 1980. In English with French summ. SFA 25(3)

[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] During the summer of 1974, approximately 12,000 coho were accelerated to the smolt stage through control of temperature, photoperiod, and feeding rate at Rosewall Creek on Vancouver Island. The fish were marked, nose-tagged and released on November 6, 1974. Early maturing male (jack) and normal-aged (adult) coho originating from these releases were recovered in the escapement and in the fishery. The total return of adults of 6.46% from the fall release (November 6) of 10-g accelerated 11-mo-old smolts was compared with the returns from a spring release (June 10) of 9-g accelerated 6-mo-old and 19-g normally reared 14-mo-old smolts. The return from the fall accelerated smolts was double that from the spring accelerated smolts (3.3%). Both these returns were far below the return of 47.5% from the June release of normally reared (14 mo+) smolts. Among the accelerated fish females predominated (66%) among adults from the fall release, the reverse being true for the spring release with 64% males. Also, adults from the fall release were larger than those from the spring release, but smaller than those from the normally reared smolts. Results of these studies indicate that rearing of accelerated smolts is at present not economically advantageous.

80-002414 Bilton, H. T. RETURNS OF ADULT COHO SALMON IN RELATION TO MEAN SIZE AND TIME AT RELEASE OF JUVENILES TO THE CATCH AND THE ESCAPEMENT. *Can. Dep. Fish. Oceans Tech. Rep.* No. 941. iv + 41p. May 1980. In English with French summ. SFA 25(3)

[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] An experiment was conducted to determine the effects of time and size at release of juvenile coho salmon on their subsequent survival, growth, and age at maturity. Four releases of marked and nose-tagged coho salmon smolts were made from Rosewall Creek, Vancouver Island, April 14, May 12, June 10, and July 8, 1975. In the fall of 1975, 1,417 tagged jacks (age 1.0) were recovered and in the fall of 1976, 2,885 tagged adults (age 1.1) were recovered at Rosewall Creek. In addition, 21,333 fish were estimated to have been caught by the fishery during 1975 and 1976. Analysis of these returns with special reference to the production of jacks and adults indicated that the yield of jack biomass was positively correlated with the size of smolt released. Larger smolts at release returned more heavily as jacks. Jack size and smolt size were also positively correlated, therefore large smolts not only produced a greater percentage of jacks, they also were of a larger size. Later releases produced fewer jacks than did early releases. Hence jack production is favoured by large smolts released early. Furthermore, the production of jacks reduced the production of adults, as indicated by a highly significant positive correlation between the proportion of jacks represented in the total return and the average smolt size. The largest smolts at release did not produce more adults. Smolt size and time of release did, however, have a positive influence on adult size: larger smolts of early releases returned as larger adults. On the basis of these data, an attempt was made to estimate which combination of time of release and smolt size produced the highest return of adult biomass per 100,000 smolts. In general, the greatest adult biomass was achieved from smolts of a moderate size (20-24 g) released late in the season (early June). The highest production of jack biomass was achieved by the release of large smolts early. On the average, the fishery caught 88% of the fish that returned from the four releases. With the exception of

STOCKING AND INTRODUCTIONS (CONTINUED)

80-002414 CONTINUED fish from the July release, the fishery tended to select a higher proportion of the larger fish from each population. For the July smolts there was a tendency for selection of the small fish. The proportion of fish from the four releases caught in the Georgia Strait sport fishery ranged from 41% for the April release to 59% for the July release. The proportion of fish from each release caught off the west coast of Vancouver Island tended to decrease in the later releases. The percentage of fish from the four releases caught in Southern United States net, troll and sport fisheries (California, Oregon and Washington) averaged 11%, ranging from 9% of the May fish to 12% of the July fish.

80-002415 McCoid, M. J. and J. A. St. Amant. NOTES ON THE ESTABLISHMENT OF THE RAINWATER KILLIFISH, *LUCANIA PARVA*, IN CALIFORNIA. *Calif. Fish Game* 66(2):124-125. Apr. 1980. SFA 25(3)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843]

80-002416 Pelzman, R. J. IMPACT OF FLORIDA LARGEMOUTH BASS, *MICROPTERUS SALMOIDES FLORIDANUS*, INTRODUCTIONS AT SELECTED NORTHERN CALIFORNIA WATERS WITH A DISCUSSION OF THE USE OF MERISTICS FOR DETECTING INTROGRESSION AND FOR CLASSIFYING INDIVIDUAL FISH OF INTERGRADED POPULATIONS. *Calif. Fish Game* 66(3):133-162. July 1980. SFA 25(3)
[Calif. Dep. Fish Game, 1701 Nimbus Rd., Rancho Cordova 95670] Florida largemouth bass, *Micropterus salmoides floridanus*, had a notable genetic impact following their introduction into five northern California waters containing northern largemouth bass, *M. s. salmoides*, populations: Folsom Lake, New Hogan Reservoir, Lake Amador, Lake Isabella, and Clear Lake. Analysis of malate dehydrogenase isozyme patterns of fish systematically collected in years subsequent to the introduction indicated that intergraded populations developed at each of the waters. Incidence of the Florida allele at the study waters, based on malate dehydrogenase analyses, eventually ranged from 0.35 at Lake Amador to 0.52 at both New Hogan Reservoir and Clear Lake. Discriminant function analysis of meristic data for fish of known electrophoretic phenotype showed that meristic values were not reliable for classifying individual fish from mixed populations as to Florida, northern, or hybrid bass categories. This was supported by meristic data for known $F_1$ hybrids. Hybridization could not necessarily be detected by an increase in mean meristic value or by unimodality of a frequncy distribution of meristic values. The mode value of lateral line scale counts appeared to be the best meristic indicator of hybridization. Information from this study and from a similar study at southern California waters indicates that introductions of Florida bass into northern bass populations have generally been beneficial through reducing high exploitation rates, increasing the mean size of bass in the catch, and providing exceptional fishing for trophy-sized bass at some waters. Results of this study indicate that current largemouth bass populations at the study waters possess a wider spectrum of performance capabilities through the inclusion of desirable traits attributed to Florida bass. This is particularly advantageous in the reservoir setting where heavy angling pressure, water level manipulation, competition of prey species with small bass, and other factors work against the maintenance of a bass population.

FISHING GEAR AND TECHNIQUES

80-002417 Bagenal, T. B. EIFAC FISHING GEAR INTERCALIBRATION EXPERIMENTS. *EIFAC Tech. Pap.* No. 34. vi + 87p. 1979. SFA 25(3)
[Freshwater Biol. Assoc., Windermere Lab., Ambleside, Cumbria LA22 0LP, England]

FISHING GEAR AND TECHNIQUES (CONTINUED)

80-002418 Dauble, D. D. and R. H. Gray. COMPARISON OF A SMALL SEINE AND A BACKPACK ELECTROSHOCKER TO EVALUATE NEARSHORE FISH POPULATIONS IN RIVERS. *Prog. Fish-Cult.* 42(2):93-95. Apr. 1980. SFA 25(3)
[Freshwater Sci., Ecol. Sci., Pac. Northwest Lab., P.O. Box 999, Richland, WA 99352]

80-002419 Hall, R. E. and L. Durham. MULTIPLE METHOD ESTIMATES OF FISH POPULATIONS IN A SMALL POND. *Trans. Ill. State Acad. Sci.* 72(2):74-80. 1979. SFA 25(3)
[WAPORA, Inc., R.R. 2, Charleston, IL 61920] Single and multiple capture-recapture procedures were undertaken using hoop nets, gill nets, seining, and electroshocking to sample the fish populations. Multiple-method procedures were employed to study their effects on capturing selectivity and differential vulnerability to capture. Multiple procedures, which involved capture and recapture with two or more sampling methods, yielded more unbiased and accurate population estimates than single method procedures.

80-002420 Houk, J. L. A DIVER-OPERATED SNAGGING DEVICE FOR CAPTURING LINGCOD, *OPHIODON ELONGATUS*. *Calif. Fish Game* 66(3):187-188. July 1980. SFA 25(3)
[Mar. Cult. Lab., Calif. Dep. Fish Game, Granite Canyon, Coast Route, Monterey 93940]

80-002421 Leclerc, J. and G. Power. SELECTIVITY OF FLY-FISHING, SPINNING AND GILLNET FOR BROOK CHARR AND OUANANICHE IN A LARGE NORTHERN QUEBEC RIVER. *Environ. Biol. Fishes* 5(2):181-184. 22 Apr. 1980. SFA 25(3)
[Cent. Etud. Nord., Univ. Laval, PQ G1K 7P4, Canada] A comparison between fly-fishing, spinning and short 51 mm and 25 mm gill nets showed that fly-fishing was the least selective method of sampling brook charr, *Salvelinus fontinalis*, and ouananiche, *Salmo salar*, in rapid sections of the Caniapiscau River, north central Quebec. Angling techniques had the added advantage of mobility which allowed rapids to be more evenly covered during sampling. Selectivity curves for the capture of brook charr by fly-fishing, spinning and a 51 mm mesh gill net are presented.

80-002422 Matuda, K. [MOVING SPEED OF BOTTOM DRIFT NET.] *Bull. Jpn. Soc. Sci. Fish.* 46(3):275-280. Feb. 1980. In Japanese with English summ. SFA 25(3)
[Tokyo Univ. Fish., 5-7, Konan-4, Minato-ku, Tokyo 108, Japan]

80-002423 Serns, S. L. RELATIONSHIP OF WALLEYE FINGERLING DENSITY AND ELECTROFISHING CATCH PER EFFORT IN NORTHERN WISCONSIN LAKES. *Wis. Dep. Nat. Resour. Fish Manage. Rep.* 104. Sept. 1979. SFA 25(3)
[P.O. Box 440, Woodruff, WI 54568] Investigations conducted on 13 northern Wisconsin lakes over a seven year period revealed a significant positive linear relationship between walleye fingerling catch per effort by electrofishing and fingerling density (both in number per acre and number per mile of shoreline). The best formula for describing fingerling density (number per acre) was: $Y = 0.234 X$, where Y = fingerling density and X = fingerling catch per mile of shoreline with an electroshocker (catch per effort). Electrofishing efficiency was negatively correclated with lake surface area and shoreline length. Efficiency was not related to conductivity, shoreline development factor, fingerling CPE or fingerling density. The mean total length of native walleye fingerlings was not related to fingerling density or lake conductivity.

FISHING GEAR AND TECHNIQUES (CONTINUED)

80-002424 Tanida, K. ON THE RHEOLOGY OF NETTING TWINE--V. 4 ELEMENT MODEL. *Bull. Jpn. Soc. Sci. Fish.* 46(3):281-287. Feb. 1980. SFA 25(3)
[Tokyo Univ. Fish., 5-7, Konan-4, Minato-ku, Tokyo 108, Japan]

80-002425 Weinstein, M. P. and R. W. Davis. COLLECTION EFFICIENCY OF SEINE AND ROTENONE SAMPLES FROM TIDAL CREEKS, CAPE FEAR RIVER, NORTH CAROLINA. *Estuaries* 3(2):98-105. June 1980. SFA 25(3)
[Dep. Biol., Va. Commonwealth Univ., Richmond 23264] Efficiency, defined as the percentage of the toal number of individuals captured from a known area of tidal creek (blocked with seines), was studied on six occasions from December 1976 through August 1978. Sampling was conducted at two stations near the Cape Fear River, Southport, North Carolina using either seines or rotenone. For the three most abundant species collected by each method, the range for seine efficiencies (60.6 ± 19.4 to 78.0 ± 9.4%) was generally narrower than that for rotenone (29.6 ± 9.5 to 57.7 ± 14.8%). However, overall species richness was better represented by rotenone, the mean percentage of species captured for all samples was 92.1% versus 70.3% for seines. Consistent patterns in efficiency for individual species with regard to size, age, or water temperature were absent. A comparison of individual collections with that of the sample "universe" trapped between the block nets indicated that a representative sample of the extant nekton community was taken by each method.

80-002426 Wohlgemuth, E. ON SELECTIVITY OF GILL NETS FOR, AND CERTAIN BIOLOGICAL PARAMETERS OF, *ALBURNUS ALBURNUS* AND *RUTILUS RUTILUS*. *Folia Zool.* 28(4):371-383. 1979. In English with Russian summ. SFA 25(3)
[Inst. Vert. Zool., Czechoslovak Acad. Sci., Brno, Czechoslovakia]

80-002427 Yocum, W. L. and F. J. Tesar. SLED FOR SAMPLING BENTHIC FISH LARVAE. *Prog. Fish-Cult.* 42(2):118-119. Apr. 1980. SFA 25(3)
[Great Lakes Res. Div., Univ. Mich., Ann Arbor 48109]

FERTILIZATION OF SOIL AND WATER

80-002428 Behrends, L. L.; J. J. Maddox; C. E. Madewell and R. S. Pile. COMPARISON OF TWO METHODS OF USING LIQUID SWINE MANURE AS AN ORGANIC FERTILIZER IN THE PRODUCTION OF FILTER-FEEDING FISH. *Aquaculture* 20(2):147-153. June 1980. SFA 25(3)
[Natl. Fertilizer Cent., TVA, WRSB, Muscle Shoals, AL 35660]

80-002429 Burns, R. P. and R. R. Stickney. GROWTH OF *TILAPIA AUREA* IN PONDS RECEIVING POULTRY WASTES. *Aquaculture* 20(2):117-121. June 1980. SFA 25(3)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843] *Tilapia aurea* fry were stocked in five 0.05 ha ponds at 8000 fish/ha during June 1977. Four ponds received the wastes from 500, 1000, 2000 and 4000 laying hens/ha, respectively, while the fifth pond received no poultry wastes. After a 150-day growing period, final mean fish weights and average daily production paralleled the rates of organic fertilization. *T. aurea* averaged only 46 g in the pond which received no organic fertilization, but reached an average of 304 g in the pond fertilized by the wastes from 4000 hens/ha. Thus, *T. aurea* can be reared to market-size in Texas within a single growing season if sufficient levels of nutrient are available. Survival reached or exceeded 95% in all five ponds. Water quality remained within acceptable limits throughout the experiment, although the effects of organic fertilization on water quality were apparent.

FERTILIZATION OF SOIL AND WATER (CONTINUED)

80-002430 Chattopadhyay, G. N. and L. N. Mandal. INORGANIC TRANSFORMATION OF APPLIED PHOSPHORUS IN BRACKISHWATER FISH POND SOIL UNDER DIFFERENT WATER SALINITY LEVELS. *Hydrobiologia* 71(1-2):125-130. 27 May 1980. SFA 25(3)
[Cent. Inland Fish. Res. Inst., Barrackpore, West Bengal, India] Transformation of applied phosphorus in a brackishwater fish pond soil was studied under different water salinity levels, as occurring in such ponds, in presence and in absence of added organic matter. Added phorphorus was found to disappear rapidly from the water phase with some variations under different water salinities. The amount of added phosphorus in saloid-bound form increased with increase in water salinity but the same in Bray's (No. 2) extractable form showed a reverse trend. Applied phosphorus was transformed mostly into insoluble calcium phosphate form which increased with increase in water salinity. Transformation was intermediate into iron phosphate and the least into aluminium phosphate form. Application of organic matter reduced the fixation of added phosphorus into the iron phosphate form during the initial period of study and thus increased availability of phosphorus both in water as well as soil phases.

80-002431 Musig, Y. and C. E. Boyd. COMPARISON OF POLYPHOSPHATE AND ORTHOPHOSPHATE AS FERTILIZERS FOR FISH PONDS. *Aquaculture* 20(2):135-138. June 1980. SFA 25(3)
[Dep. Fish., Sch. Agric., Auburn Univ., Auburn, AL 36830] Sodium polyphosphate and triple superphosphate were used as sources of polyphosphate and orthophosphate, respectively, at equal $P_2O_5$ application rates in sunfish (*Lepomis* spp.) ponds. Filtrable orthophosphate and total phosphorus concentrations were generally higher in ponds treated with polyphosphate. However, differences between chlorophyll *a* concentration and net sunfish production did not differ between treatments ($P > 0.05$).

80-002432 Stockner, J. G.; K. S. Shortreed and K. Stephens. THE BRITISH COLUMBIA LAKE FERTILIZATION PROGRAM: LIMNOLOGICAL RESULTS FROM THE FIRST 2 YEARS OF NUTRIENT ENRICHMENT. *Can. Dep. Fish. Oceans Tech. Rep.* No. 924. iv + 91p. Feb. 1980. In English with French summ. SFA 25(3)
[Dep. Fish. Oceans, 4160 Marine Dr., West Vancouver, BC, Canada] Limnological studies were conducted on five sockeye salmon (*Oncorhynchus nerka*) nursery lakes and on one lake containing landlocked sockeye (kokanee) but no anadromous fish. The lakes were fertilized with ammonium phosphate and ammonium nitrate at levels up to 505 greater than calculated annual base loads. Annual primary production ranged from 16 to 150 $gC/m^2$, and all but Long Lake were classed as oligotrophic. The phytoplankton populations were dominated by diatoms; blue-green algae did not increase significantly with fertilization. Annual primary production and mean annual total chlorophyll in Kennedy Lake-Clayoquot Arm were 2 times higher in 1978 (fertilized) than in 1977 (unfertilized). Algal production and biomass in the remaining 5 lakes tended to be higher in the second year of fertilization (1978) than in the first (1977). Limnological conditions in all 5 lakes are discussed, where possible, with reference to higher trophic levels.

FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC.

80-002433 Logan, B. E. and M. T. Masnik. IMPINGEMENT DYNAMICS AND AGE AND GROWTH OF SELECTED SPECIES AT LAKE DARDANELLE, A SOUTHCENTRAL RESERVOIR. *U.S. Nucl. Regul. Comm. Environ. Spec. Br. Tech. Rep.* NUREG-0601. vii + 54p. Oct. 1979. SFA 25(3)
[Environ. Spec. Br., P-234, Div. Site Safety & Environ. Anal., U.S. Nucl. Reg. Comm., Washington, D.C. 20555] Impingement data collected between 1974

FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC. (CONTINUED)

80-002433 CONTINUED and 1979 was analyzed and compared with four years of data from Arkansas Nuclear One located on Lake Dardanelle, a southcentral run-of-the-river reservoir. *Dorosoma petenense, D. cepedianum, Ictalurus punctatus, Lepomis macrochirus,* and several other recreationally or ecologically important species commonly found on the intake screen were chosen for comparison. Weekly natural log transformed impingement estimates were plotted, and yearly impingement estimates were determined over the five year period. An analysis of variance on the transformed weekly estimates of eight species of fish indicated the significance ($F < .002$) of temperature on impingement for seven species. Yearly impingement of *D. petenense* was found to be correlated ($R^2 = .965$) with the average minimum water temperature of the reservoir. The lethal temperature threshold (as recorded at the intake) was determined to be between 3.3 and 5.5°C for *D. petenense* and 0.5 and 0°C for *D. cepedianum.* Results of the impingement analysis were compared and contrasted with age and growth studies in the reservoir.

80-002434 Moazzam, M. and S. H. N. Rizvi. FISH ENTRAPMENT IN THE SEAWATER INTAKE OF A POWER PLANT AT KARACHI COAST. *Environ. Biol. Fishes* 5(1):49-57. 30 Jan. 1980. SFA 25(3)
[Inst. Mar. Biol., Univ. Karachi, Karachi-32, Pakistan]

MATHEMATICS, STATISTICAL METHODS, AND MODELING

80-002435 Blinov, V. V.; Ye. A. Mitrofanov and V. V. Shevchenko. A STUDY OF THE RATIONAL EXPLOITATION OF A COMMERCIAL POPULATION OF THE NORTH SEA HADDOCK, *MELANOGRAMUS AEGLEFINUS,* BY MEANS OF A PRODUCTION MODEL. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):55-62. 1979. SFA 25(3)
[VNIRO, Moscow, USSR] For a calculation of the biomass of the North Sea haddock, *Melanogrammus aeglefinus,* the influence of exploitation rates and food consumption, Daan's bioproduction model is used, supplemented by experimental data on the feeding of the haddock.

80-002436 Cohen, M.-D. and G. S. Fishman. MODELING GROWTH-TIME AND WEIGHT-LENGTH RELATIONSHIPS IN A SINGLE YEAR-CLASS FISHERY WITH EXAMPLES FOR NORTH CAROLINA PINK AND BROWN SHRIMP. *Can. J. Fish. Aquatic Sci.* 37(6):1000-1011. June 1980. In English with French summ. SFA 25(3)
[Curric. Operations Res. Syst. Anal., Univ. N.C., Chapel Hill 27514]

80-002437 Deriso, R. B. HARVESTING STRATEGIES AND PARAMETER ESTIMATION FOR AN AGE-STRUCTURED MODEL. *Can. J. Fish. Aquatic Sci.* 37(2):268-282. Feb. 1980. In English with French summ. SFA 25(3)
[Curric. Mar. Sci., Univ. N.C., Chapel Hill 27514]

80-002438 McGaw, R. L. CONFIDENCE INTERVALS FOR OPTIMAL EFFORT ESTIMATES FROM THE SCHAEFER PRODUCTION MODEL. *Can. J. Fish. Aquatic Sci.* 37(2):288-289. Feb. 1980. In English with French summ. SFA 25(3)
[Dep. Econ., Univ. New Brunswick, Fredericton, NB E3B 5A3, Canada]

80-002439 Wlosinski, J. H. PREDICTABILITY OF STREAM ECOSYSTEM MODELS OF VARIOUS LEVELS OF RESOLUTION. *Ph.D. dissertation, Utah State Univ.* 149p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(11):5131. May 1980. SFA 25(3)

## LAKE MANAGEMENT AND RESEARCH

80-002440 Healey, M. C. GROWTH AND RECRUITMENT IN EXPERIMENTALLY EXPLOITED LAKE WHITEFISH (*COREGONUS CLUPEAFORMIS*) POPULATIONS. *Can. J. Fish. Aquatic Sci.* 37(2):255-267. Feb. 1980. In English with French summ. SFA 25(3)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

80-002441 Swierzowska, L. CHANGES OF EEL EXPLOITATION IN POLISH LAKES. *Aquaculture* 20(1):71-75. May 1980. SFA 25(3)
[Inland Fish. Inst., Olsztyn, Poland] The paper discusses briefly eel exploitation and traditional methods of catching eel. Attention is drawn to changes taking place in eel exploitation in Polish lakes, and to their causes. Most effective methods of eel catching are reviewed. It is pointed out that utilization of active fishing gear, mainly seine nets and electric aggregates, creates significant possibilities of increasing eel catches. Eel yields up to 40 kg/ha are not unusual with this type of gear. Furthermore, active fishing gear is more effective and can be used also in lakes in which it is difficult to apply traditional eel traps. The latter fact is of special significance in view of the increasing number of lakes stocked with eel, and improvement of eel stocking effectiveness.

## RIVER AND STREAM MANAGEMENT AND RESEARCH

80-002442 Ellis, J. M.; G. B. Farabee and J. B. Reynolds. FISH COMMUNITIES IN THREE SUCCESSIONAL STAGES OF SIDE CHANNELS IN THE UPPER MISSISSIPPI RIVER. *Trans. Mo. Acad. Sci.* 13:5-20. 1979. SFA 25(3)
[Mo. Dep. Conserv., Kirksville 63501] During 1975-76, we compared the limnology and fish communities of three side channels of the Mississippi River in northeast Missouri: a riverine side channel (Buzzard Island), which had high flow rates, a sand-mud bottom and negligible thermal stratification; a lacustrine channel (Cottonwood Island), which had low flow rates, a mud-silt bottom, thermal stratification, and dissolved oxygen concentration as low as 1.0 mg/l during late summer; and a transitional side channel (Orton-Fabius Island), which was partly blocked with sediments, had intermediate physico-chemical characteristics, and was apparently changing from a riverine to a lacustrine habitat. Buzzard channel contained certain riverine species that Cottonwood channel apparently did not, and Cottonwood yielded certain lacustrine species not collected in Buzzard. Relative abundance of game and panfishes was lowest in Buzzard channel and highest in Cottonwood; the reverse was true of catfishes. Electrofishing, which yielded mainly panfishes, was probably the most reliable indicator of habitat changes resulting from side-channel succession; hoop netting for catfishes also provided reliable indications, but fewer species and numbers of fish were taken in relation to the effort expended. Artificial opening of transitional side channels may reduce losses of riverine side channels in the upper Mississippi River. Lack of mitigation will result in the continued loss of riverine habitat and its fish communities. Societal values must be employed in a choice between the maintenance of side channel habitat and its associated fishes, or the succession of channels to lacustrine habitat which temporarily supports different fishes before changing to permanent floodplain.

80-002443 Kuznetsov, V. A. and N. I. Fadeyev. SOME FEATURES OF THE REPRODUCTION OF FISHES IN PARTS OF THE VOLGA BEFORE AND AFTER FLOW REGULATION. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(1):81-90.

RIVER AND STREAM MANAGEMENT AND RESEARCH (CONTINUED)

80-002443 CONTINUED 1979. SFA 25(3)
[Dep. Vert. Zool., Kazan' Univ., USSR] The conditions, times, duration and success of reproduction of fish in the Volga around Koz'modem'yansk (in the zone of the former Cheboksary reservoir) and in the upper part of Kuybyshev reservoir were studied in years with similar flows. In years with a low spring runoff, spawning success is greater in the river than in the reservoir; in high-water years with a relatively stable water level in spring it may be higher in the reservoir than in the river. Differences were noted in the yield of young of different species depending on the spawning period.

80-002444 McNatt, R. M. FISH HABITAT LOSS IN THE SAN PEDRO RIVER, ARIZONA. *Summ. Proc. Annu. Symp. Desert Fish. Counc.* 10:19-23. 30 Jan. 1980. In English with Spanish summ. SFA 25(3)
[U.S. FWS, Albuquerque, NM] The San Pedro River basin formerly consisted of a large perennial mainstream with associated springs and tributaries. Diversions, headwater impoundments, depletion of underground aquifers, clearing of riparian habitats, and a possible regional tendency toward increasing aridity have reduced mainstream surface flow to that of an intermittent stream, with perennial flow in 3 sections which comprise only 50 km of the total river length of 250 km. Aravaipa Creek, the largest tributary, presently contains 7 of the 13 native species reported from the basin, and is the only portion of the entire drainage that supports a relatively secure native fish fauna. Of the 7 species in Aravaipa Creek, 4 have not been found elsewhere in the basin since at least 1963.

80-002445 Winter, F. A. WHAT THE CIBOLA NATIONAL FOREST HAS DONE FOR THE ZUNI MOUNTAIN SUCKER, *PANTOSTEUS DISCOBOLUS YARROWI*. *Summ. Proc. Annu. Symp. Desert Counc.* 10:50. 30 Jan. 1980. Abstract only. SFA 25(3)
[Cibola Natl. For., Albuquerque, NM]

80-002446 Wydoski, R. S.; K. Gilbert; K. Seethaler; C. W. McAda and J. A. Wydoski. ANNOTATED BIBLIOGRAPHY FOR AQUATIC RESOURCE MANAGEMENT OF THE UPPER COLORADO RIVER ECOSYSTEM. *U.S. Fish Wildl. Serv. Resour. Publ.* 135. ii + 186p. 1980. SFA 25(3)

FARM POND AND SMALL IMPOUNDMENT MANAGEMENT AND RESEARCH

80-002447 LaBolle, L. D., Jr. A LIMNOLOGICAL STUDY OF THE WINTER CONDITIONS IN WINCHESTER LAKE, IDAHO. *Univ. Idaho For. Wildl. Range Exp. Stn. Curt Berklund Undergrad. Honor. Self-Initiated Res.* p. 5-16. 1979. Available from For. Wildl. Range Exp. Stn., Univ. Idaho, Moscow 83843. SFA 25(3)
Limnological conditions under winter ice were studied in Winchester Lake, a 38-ha impoundment located in Lewis County, Idaho. Dissolved oxygen concentrations were compared with the data collected on the temporal and spatial variation of the zooplankton, phytoplankton, and benthic macroinvertebrate populations. Invertebrate density and species composition expressed apparent positive correlations with variations in dissolved oxygen. Phytoplankton, however, showed no relationship. Through reflectance and absorptive mechanisms, the ice and snow cover caused up to a 99.8 percent reduction in the incident sunlight available for photosynthetic oxygen production. Hence, the dissolved oxygen concentration in the water was inversely related to the depth of the ice and snow cover. Dissolved oxygen analysis revealed that only 10.1 percent of the lake volume provided suitable conditions for the support of viable trout populations during the winter

FARM POND AND SMALL IMPOUNDMENT MANAGEMENT AND RESEARCH (CONTINUED)

80-002447 CONTINUED months. Although limited photosynthetic oxygen production did occur, inflows of oxygenated water were important in providing adequate oxygen levels for the overwintering trout populations during periods of continuous ice and snow cover.

LARGE IMPOUNDMENT MANAGEMENT AND RESEARCH

80-002448 Hoffman, R. DOCTORING BIG MAC. *Nebraskaland* 58(5):16-17, 43-44, 46. May 1980. SFA 25(3)

80-002449 Holden, P. B. WILL OUTLET MODIFICATION OF FLAMING GORGE DAM HELP THE COLORADO SQUAWFISH? *Summ. Proc. Annu. Symp. Desert Fish. Counc.* 10:37. 30 Jan. 1980. Abstract only. SFA 25(3)

[BIO/WEST, Inc., Logan, UT] Flaming Gorge Dam was closed in 1962 and in the following 4-5 years an excellent tailwater trout fishery was established. During this same period, Colorado squawfish were eliminated for 65 miles below the dam, to the mouth of the Yampa River. Below this point, squawfish were fairly common and reproduced successfully. The tailwater trout fishery started to decline in 1968-69, at the same time that Colorado squawfish reproduction stopped in the Green River in Dinosaur National Monument. Cold tailwater temperatures were blamed for both declines. An analysis of temperature and flow data from the Green River indicated that tailwater temperatures were reduced more due to high flows than actual release temperatures. The Bureau of Reclamation installed outlet modifications in 1978 to warm the tailwater temperatures and, hopefully, improve the trout fishery. BIO/WEST is conducting a study below the trout habitat portion to determine effects of the modifications on distribution and reproduction of warm water fishes. The study is designed to last 3 years and compare pre- and post-modification conditions. Data collected to date suggests native species will successfully reproduce in portions of the river previously too cold for reproduction.

MARINE MANAGEMENT AND RESEARCH

80-002450 Anderson, E. D.; F. E. Lux and F. P. Almeida. THE SILVER HAKE STOCKS AND FISHERY OFF THE NORTHEASTERN UNITED STATES. *Mar. Fish. Rev.* 42(1):12-20. Jan. 1980. SFA 25(3)

[NMFS, Woods Hole, MA 02543]

80-002451 Giddings, G. G. SOUTH AMERICAN HAKES: THE RESOURCE AND ITS UTILIZATION. *Mar. Fish. Rev.* 42(1):8-11. Jan. 1980. SFA 25(3)

[Fund. Chile, Casilla 773, Avda. Santa Maria 06500, Santiago, Chile]

80-002452 Grant, C. J.; R. L. Sandland and A. M. Olsen. ESTIMATION OF GROWTH, MORTALITY AND YIELD PER RECUIRT OF THE AUSTRALIAN SCHOOL SHARK, *GALEORHINUS AUSTRALIS* (MACLEAY), FROM TAG RECOVERIES. *Aust. J. Mar. Freshwater Res.* 30(5):625-637. Oct. 1979. SFA 25(3)

[Zool. Dep., Univ. West Indies, Mona, Kingston 7, Jamaica] A study of growth, mortality and yield per recruit of *G. australis* in south-eastern Australia has been undertaken. The species is long-lived, slow growing and has a low natural mortality rate. The fishery in Victoria was recently adversely affected by the imposition in 1972 of an upper size limit of 104

MARINE MANAGEMENT AND RESEARCH (CONTINUED)

80-002452 CONTINUED cm, in addition to an existing legal minimum length of 91 cm, to ensure that sharks with flesh mercury levels in excess of 0.5 µg/g were not taken for human consumption. More recent (1976) legislation altered these limits to a minimum length of`71 cm and a maximum length of 112 cm. This paper discusses the possible effects of increased exploitation within the length limitations which are currently operative on the availability of breeding stock of the school shark.

80-002453 Wine, V. L. PRELIMINARY REPORT ON THE ABILITY OF MARINE RECREATIONAL FISHERMEN TO IDENTIFY THE MORE COMMONLY CAUGHT SPORTFISH. *Calif. Dep. Fish Game Mar. Resour. Admin. Rep.* No. 79-14. 28p. Dec. 1979. SFA 25(2)
[Calif. State Fish. Lab., 350 Golden Shore, Long Beach 90802] Fishermen on piers and privately-owned boats in southern California were surveyed to determine their ability to identify (by common name) 18 of the more commonly caught sportfish. Anglers were shown color photographs of the fish and asked to identify them. Most people were not able to identify more than 5 or 6 species correctly. The number of incorrect responses (calling one species by another's name, or using a non-recommended common name) was not high. Instead, it was the level of non-response (the fisherman had no idea what the species was) that was surprisingly high. The results of the survey indicate that anglers are not familiar with the names of the fish they are most likely to catch. This has serious implications concerning our fishery management programs which depend on anglers' compliance with fishing regulations. The effectiveness of the programs depends in part on anglers being able to recognize regulated species when encountered.

UTILIZATION OF FISHERY PRODUCTS

80-002454 FAO of the UN. 1978 YEARBOOK OF FISHERY STATISTICS. FISHERY COMMODITIES. *FAO Fish. Ser.* 11:xvi + 279p. 1979. SFA 25(3)
[Rome, Italy]

80-002455 McMillan, A. D. ARCHAEOLOGICAL EVIDENCE FOR ABORIGINAL TUNA FISHING ON WESTERN VANCOUVER ISLAND. *Syesis* 12:117-119. 1979. SFA 25(3)
[Douglas Coll., New Westminster, BC V3L 5B2, Canada]

80-002456 Whitaker, D. R. WORLD UTILIZATION OF HAKE. *Mar. Fish. Rev.* 42(1):4-7. Jan. 1980. SFA 25(3)
[NMFS, Washington, DC 20235]

MISC. TECHNIQUES AND EQUIPMENT

80-002457 Holanov, S. H. SENSITIVE LIGHT METER FOR FISH BEHAVIOR STUDIES. *Prog. Fish-Cult.* 42(2):120-122. Apr. 1980. SFA 25(3)
[Sch. Renewable Nat. Resour., Univ. Ariz., Tucson 85721]

80-002458 Manns, R. E., Jr. and B. G. Whiteside. INACCURACY OF SEX DETERMINATION IN GUADALUPE AND LARGEMOUTH BASS ON THE BASIS OF EXTERNAL CHARACTERISTICS. *Prog. Fish-Cult.* 42(2):116-117. Apr. 1980. SFA 25(3)
[Aquatic Stn., Southwest Tex. State Univ., San Marcos 78666]

MISC. TECHNIQUES AND EQUIPMENT (CONTINUED)

80-002459 Platts, W. S. and V. E. Penton. A NEW FREEZING TECHNIQUE FOR SAMPLING SALMONID REDDS. *U.S. For. Serv. Res. Rep.* INT-248. 22p. 1980. SFA 25(3)

[U.S. For. Serv., 316 E. Myrtle St., Boise, ID 83706] This report describes a new multiprobe freeze method for determining salmonid redd sediment particle size distribution. This method will collect salmonid eggs and alevins in the redd at any stage of development, any air or water temperature, any stream depth, and determine their horizontal and vertical location. This method allows larger size samples to be collected which can help improve our understanding of embryo and alevin survival rates and causes of their mortality. This substrate freeze method differs from the past freeze methods that expanded $CO_2$ liquid to atmospheric pressure. This method expands $CO_2$ to a pressure of 78 psia (a boiling liquid - gas medium) which provides a higher heat transfer because of the better control of gas use, higher cooling efficiency, and fewer clogging problems. A field test is described where the ratio of $CO_2$ consumed to redd materials lifted was 0.34 lb $CO_2$ per 1 lb of redd material. A complete step-by-step description of the methodology is given with a listing of parts, materials, and suppliers.

80-002460 Whitworth, W. R. and R. E. Schmidt. SNORKELING AS A MEANS OF EVALUATING FISH POPULATIONS IN STREAMS. *N.Y. Fish Game J.* 27(1):91-94. Jan. 1980. SFA 25(3)

[Dep. Fish., Univ. Conn., Storrs]

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80-002461 Cleugh, T. R. and L. R. Russell. FISHERIES AND FISH RELATED PUBLICATIONS IN THE YUKON TERRITORY. *Can. Dep. Fish. Oceans Tech. Rep.* No. 938. Apr. 1980. In English with French summ. SFA 25(3)

[Dep. Fish. Oceans, 1090 West Pender St., Vancouver, BC V6E 2P1, Canada]

SPORT FISHING-TECHNIQUES, ETC.

80-002462 O'Grady, K. T. and P. C. R. Hughes. FACTORIAL ANALYSIS OF AN EXPERIMENTAL COMPARISON OF THREE METHODS OF FISHING FOR RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON, IN STILL WATER. *J. Fish Biol.* 16(3):257-264. Mar. 1980. SFA 25(3)

[Dep. Biol. Sci., City London Polytech., Old Castle St., London E1 7NT, England] A three day experiment compared angling returns for rainbow trout, *Salmo gairdneri* Richardson, using fly, spinner and worm fishing methods. The catches of these methods were most similar on the first day: 3.36/h, 2.61/h and 3.75/h for spinner, fly and worm fishing, respectively. Catch rates on subsequent days declined, but less so for worm fishing. Overall, the worm fishing method returned the highest catch rate and estimates of catch rates for a year on a trout fishery also indicated that this method returned the highest catch rate.

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